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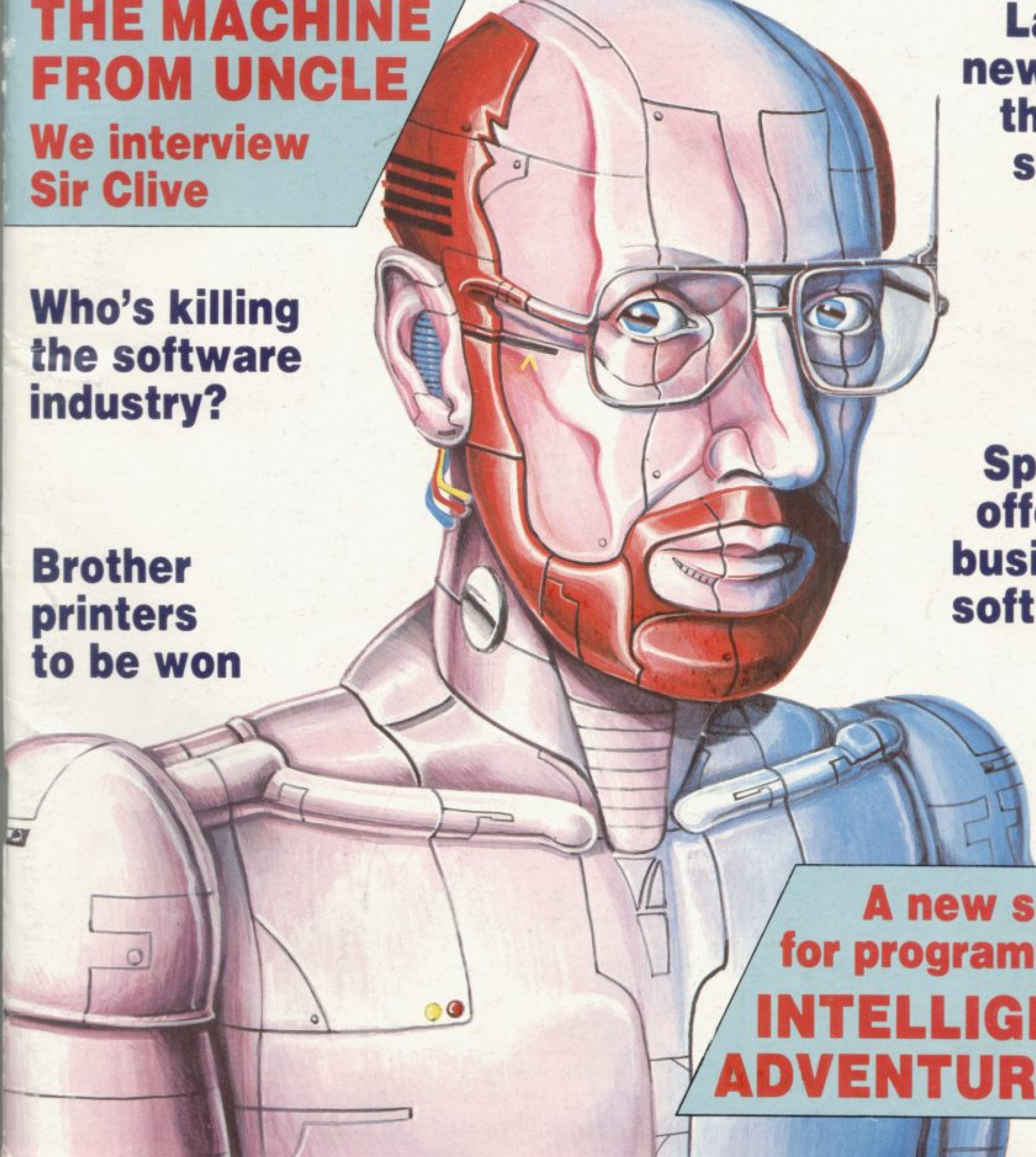
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THE MACHINE FROM UNCLE

We interview Sir Clive

Latest news on the QL scene

Who's killing the software industry?

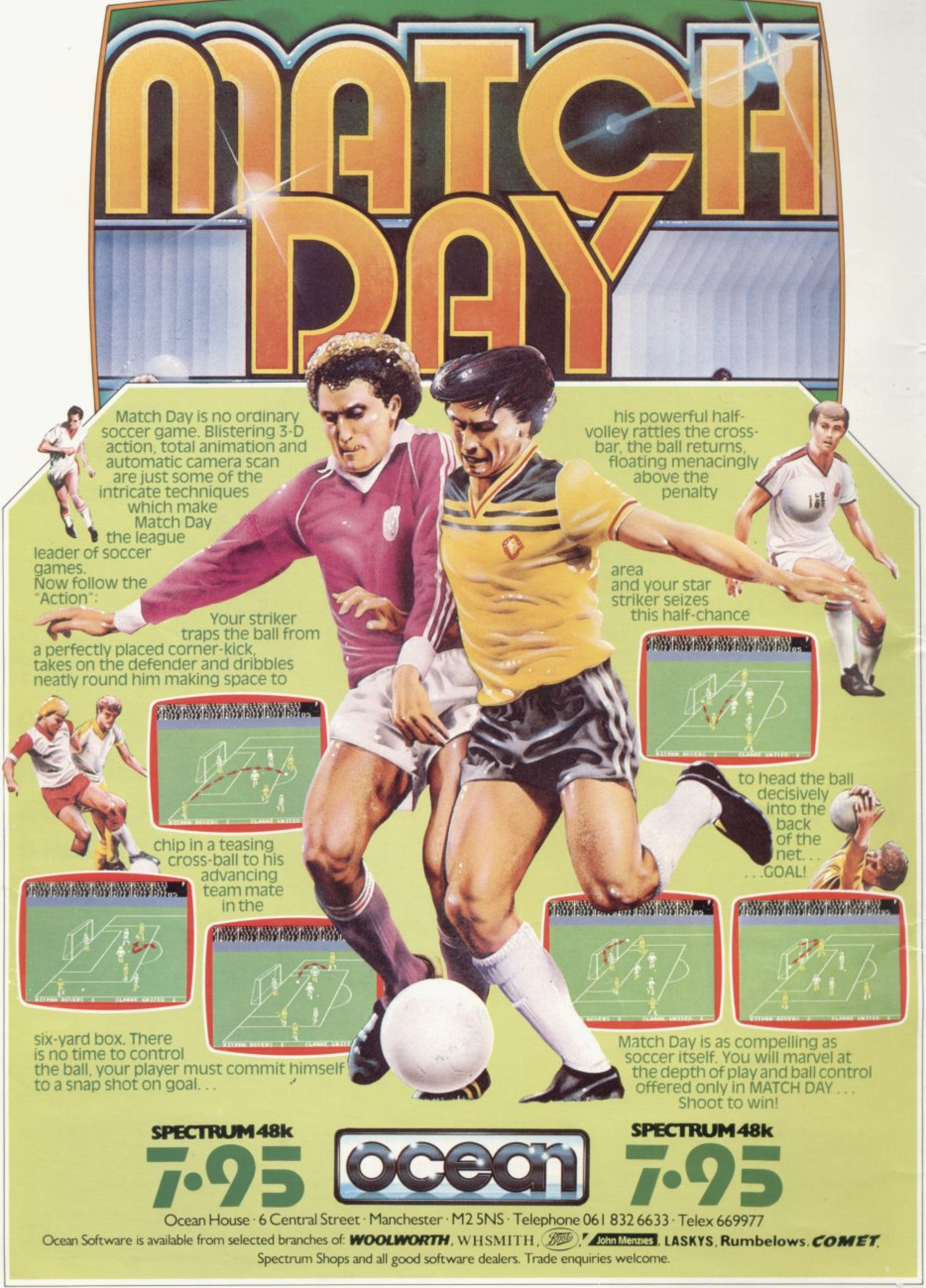


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PLUS

FORCE OF HABIT

IT USED to be one of the most embarrassing questions we micro-owners could be asked, after demonstrating the wonderful graphics and whatnot of a new machine. "Yes, but what use is it?" the hated cynics would respond, and we all muttered about tax programs or telephone directories. Of course, we knew you only do your tax once a year, and it is much easier to look up phone numbers in a book. That was not the point. The point was, doing it by computer was automatically better. It established our status as members of the techno-class, prophets of the new age, with Sir Clive in the role of Bob Dylan and the ZX-81 as his guitar.

Nowadays Sir Clive is everybody's folk hero and not the property of the pioneering elite. Even Fleet Street has given up poking fun at computer boffins and uses his name as a household word.

And, of course, what we do with home computers is all those things we could do before, and usually easier. We have software for address books, lists of recipes, and tax systems. When Sinclair introduced the QL, the machine for the home professional, what was the first commercial program which was not a programming aid? A directory of cocktails, God preserve us.



That is not because of the essential frivolity of home micro owners. It is reflected in all areas of computing. Businesses generally use a computer to replace functions of existing departments. A database, whether it is **Lotus** or **Masterfile** mimics paper filing systems. Book-keeping systems monitor existing financial structures. Thus the potential of the computer to solve hitherto insoluble problems is largely ignored. Business does not want to revolutionise work. It wants more efficient work.

Games programmers are rather different. There are many who do conceive new problems, and produce original software to deal with them. You think of games such as **Tir na Nog** or **Sherlock, TLL** or **Knight Lore.** Market research shows that tastes change as users acquire more experience. Where 45 percent of new users look for fun and excitement – arcade qualities – only 17 percent feel the same way after two or three years. Conversely, interest in specialised games, including adventure and strategy, increases from 17 to 35 percent.

But our Software Report in this month's issue indicates software houses are under increasing pressure to produce games to satisfy distributors and retailers who want to sell quickly for a high profit. That means flashy arcade games based on known formulae drawn from amusement arcades and board games. That is what they mean by talking about 'professionalism' in the industry. Standardising the product to a formula and convincing you, the consumer, that the whole thing is for your benefit entirely.

You might think the new information databases, which give instant access to enormous amounts of knowledge, would change things. But at present most business networks are little more than electronic mailboxes attached to silicon encyclopaedias. Where an interactive network such as **Micronet 800** throws itself open to the public, what do we do? We write lots of little messages to each other, many very frivolous, others more serious. After all, it's better than using the phone. Sort of.

We see something similar in education. The Government talks of a generation of computer literate kids. In April 1984 we criticised that scheme, and this month headmaster David Dodds adds flesh and bone to our argument. He tells a story of programmers, who do not understand education, returning to drill techniques of the 19th century. That has nothing to do with the exciting future envisaged by enthusiasts like Sir Clive.

He sees it differently. He has visions of robot supermen descending on the starving third world to teach it how to feed itself. He thinks we can all live like the aristocrats of ancient Athens, with robots as slaves. Never mind that the rich West has shown small willingness to give away the existing benefits of new technology. Never mind that the Athenians were an impoverished lot in a world of violent instability. Those things could be, and the optimist says they shall be.

Sir Clive admits that what he sees today is disappointing and doubts whether government is likely to do much to create a radically new society. It is entrepreneurs like himself who will do it.

But our entire social and economic structure was never designed for it. It was built to make the best of a bad job in a world where there was a lot of hard, unrewarding work to be done and not much enthusiasm for it. We are not talking about the last 150 years, but attitudes which stretch back millenia. They are the attitudes which say men must compete rather than cooperate with robots.

Perhaps the information technology, Micronet and its big brothers, will inch us forward. Perhaps 1985 will be the year of the modem. But as long as those systems are used as a new way of doing old things, nothing much will change as far as the quality of life goes. D H Lawrence wrote: "Don't make a revolution in the name of organised labour. God knows man has had enough of labouring. Let's make a revolution for fun." If you want to see Sir Clive's golden age, you must change attitudes, and change them yourselves. Hackers, Micronetters, arcade junkies and code freaks, it really is down to you.

Chris Bourne

COMING SOON.
NEW HARDWARE
FOR ALL SPECTRUM USERS

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SPRITE BOARDS

CREATE YOUR OWN ANIMATION WITH UP TO 30 PROGRAMMABLE SPRITES FOR JUST £129.95 INC. VAT

Most people first encounter "sprites" when playing arcade games like Space Invaders, Pac Man or Frogger. They offer the ability to move fast-changing images around the screen, sufficiently rapidly to give an illusion of animated motion.

Most computer games programmers achieve this speed by writing sprite routines into their programs in machine code. But this is a laborious process, certainly not accessible to novices, and uses up a great deal of the computer's memory space.

The Logotron Sprite Board allows inexperienced programmers to create the same spectacular effects. Furthermore, the Sprite Board controls the video output, and actually frees computer memory for running programs.

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Logotron's Sprite Board is available for the Sinclair Spectrum and the BBC Model 'B'. You can use them with programs written in LOGO, BASIC or any other programming language.

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Micro survey slams Spectrum reliability

ONE IN four Spectrums are faulty, according to a recent survey on the reliability of home micros. The most reliable machines were the Electron and BBC, at five percent, and the Amstrad.

"A completely silly and skewed result" says Sir Clive Sinclair. "Acorn did it and they are biased because they are trying to get the figures they want."

The survey, commissioned by Acorn's advertising agency, was conducted over March-September when few computers were sold. The high Spectrum returns are seen as a product of the Christmas sales boom, during which, according to Sir Clive, Acorn did not sell many computers. Acorn machines therefore had fewer returns against sales during the survey period.

"He's got a point, but I don't think it stands up 100 percent" says Stephen Palmer, PR spokesman for Acorn. "Acorn volume sales over Christmas may have been a bit lower than Sinclair, but the same principles apply. It is difficult to justify 24 percent against five percent."



Sir Clive: "A completely silly and skewed result."

Sir Clive claims the true figure for faulty machines is nearer 13 percent with no faults discovered in more than 40 percent of those returned to Sinclair.

Frankie say buy Ocean

FRANKIE'S come back from Hollywood to teach your computer how to relax in a game which will be launched within the next few months.

A deal has been made between Ocean Software, Island Records and ZTT, the band's creative producers, to produce a Frankie Goes to Hollywood game for the Spectrum and the Commodore 64.

David Ward from Ocean says "The game interprets the Frankie Goes to Hollywood concept of life imitating art", — if that doesn't leave you any the wiser, he adds, "the impact of the name and the concept of Frankie Goes to Hollywood translates into a game — you could describe it as an animated strategy adventure played on several levels."

The revenue from the game will be split between the three companies involved in its production with royalties going to the band. The band will be doing their share by signing autographs and generally promoting the game.

Nationwide discounts

DISCOUNT software is the bait to be used by the Nationwide Building Society in an attempt to lure customers to their doors.

Aimed at the young investor, anyone who places £25 or more into a new or existing account will recieve a token worth £3 off Spectrum software redeemable at any branch of W H Smith.

According to Moira Cook at the Nationwide, the company decided to base its promotion on computer software as, "nowadays, young peoples interests lie in computers".

The offer will be open until 30 March, 1985 on any piece of Spectrum software.

Atari declares war

ATARI has cut the price of the 800XL micro to £129.99.

It is the second price cut in three months, and a clear indication from new Atari boss Jack Tramiel that the company intends to compete with much greater aggression than before.

"Our aim is to produce the highest quality machines at the best possible price" says Product Manager John Dean. "When we were part of Warner, Warner did not appreciate the quality of the product we had. The only thing we have in common with those days is the five letters of the name. The new price reflects that we will sell at whatever price we can."

Silica Shop, a major Atari dealer, recognises that the Sinclair name is hard to beat. "When parents come to buy a Christmas present, they have a name on the top of their list. But if people find Spectrums are in short supply then Atari will take a Sinclair sale."

Dean is more optimistic. "We can't expect to outsell Sinclair this Christmas, but in another two or three months we will be making ground. Our aim is to be the No 1 home computer manufacturer by October 1985."

News from Micronet 800

MICRONET 800, the down-the-phone computer magazine, is playing host to a new user group specifically for Spectrum owners. Called the Spectrum User to User Group — SUTUG — the new club is organised around the exchange of member's software via the telephone system.

SUTUG was established by Michael Kent and Robert Garbutt who set up a directory of Micronet members willing to take part in the software exchange.

The communications program which makes this possible is available from Micronet as telesoftware — software sent down the phone-line — and allows users to send Basic and machine code programs at a speedy 1200 baud using the Spectrum VTX 5000 modem.

Co-ordinating SUTUG is Micronet's resident designer Anna Smith. "The software we use," she explains, "was written by OE Ltd, the people who make the Spectrum QL modems. But we're also very pleased about a new telesoftware program, available free from SUTUG, which lets Spectrum owners use their machines to edit Prestel pages."

Anna enthuses about a new program written by a SUTUG member which enables Spectrum users to make more use of Micronet's electronic mail facility.

"One of our members is a vicar, the Reverend Haywood, and he's produced a program which lets us compose electronic mail before we even pick up the phone. You can write up to 26 messages off-line and then dial into Micronet and dispatch them."

Sid Smith
news editor of Micronet 800

more news on page 8

Traditional Xmas tales

ONCE AGAIN, demand at Christmas for Sinclair products, specifically the Spectrum+, was running ahead of production.

"We are getting adequate supplies but could do with more," says a spokesman for W H Smiths. She adds that although there were initial problems with loose keys on the new keyboard, the fault had now been rectified.

Independent stores are also experiencing supply problems. Mike West of Silica Shop says: "I don't think I've ever known a situation where a Sinclair product has been in surplus. You are left with an ecstatic feeling about the success of the product followed by the realisation that you haven't actually got any to sell."

A feature of computer sales at Christmas was the contraction in the season. Bill Nichols of Sinclair Research comments "This year people have been confident of obtaining what they want and have consequently waited until the last three weeks before buying." Sir Clive Sinclair admits there is a problem: "We are oversold. We can't supply as many as the stores want."

Sinclair Research insists that the shortage is not due to production problems. "We are producing the promised 200,000 Spectrums a month, and the problem with some of the early keyboards, which were also sent to reviewers, was solved a week after the launch," explains Nichols.

Sinclair was predicting sales of more than 400,000 computers in the last quarter of the year, and 175,000 UK sales in the last four weeks alone. The company has announced the creation of 150 new jobs at its Camberwell distribution centre to cope with increased demand. "We are selling a hell of a lot more than last year" comments Sir Clive.

Multi-user harmony

SPECTRUM owners may soon be able to link up with BBC and Commodore users through a new device from Wessex Microcomputers. The WSX Mk1 is an expansion unit designed to allow hardware to be transferred from one micro to another, and includes the industry standard IEEE — 488 connector which allows the transfer of data.

Wessex director Neil Beverley believes the product will be of particular interest to schools and industry, for the creation of networks and the free use of control systems such as robots.

"We have working models for the BBC, Amstrad and Tandy colour computers, and are finalising negotiations with a larger company for the production of a Sinclair interface. Our objective is to publish an industry standard within the first ten weeks of production," says Beverley.

With a launch planned for early, 1985, Wessex believes the product, priced at under £300, will prove highly competitive against existing single-card systems which cannot be produced in quantity.

"We are also intending to sell to domestic users, as they begin to move away from games. For example, we are planning a product to combine Prestel and Teletext into one unit. We can give the purchaser an assurance that if he changes his micro from a Spectrum to a Commodore that 75 percent of his hardware will work."

Hock hacker

WINE-LOVERS will be fascinated by the arrival of the Spectrum in selected off-licences run by Peter Dominic. In order to help customers choose the wine to suit a particular meal, freelance chef Ian Hoare has written a program which links 220 dishes with 450 wines. Hoare wrote **The Computer Cookbook** for Bug-Byte, and his new program, **Vino File**, will be on sale at the off-licences as well as available for consultation.

"The wines I have chosen go well with the dishes selected," says Ian Hoare. "In certain cases the computer will recommend another drink where wine is completely inappropriate."

Of course, no true wine buff would be seen dead consulting a computer as to what he should buy. After all, nobody has yet produced a Spectrum interface to simulate the human nose.

Have car will pedal

THE PROMISED electric car from Sinclair will be 2ft 6in high by 6ft 6in long, pedal assisted, and powered by a washing machine motor.

The startling news has been confirmed by Sinclair Research, who say leaked reports are 95 per cent accurate.

The car, an open-topped three wheeler, is capable of speeds up to 15mph, but cannot accelerate from a standstill without the use of pedals.

Steering is by handlebars set under the thighs of the driver, and the whole machine has the appearance of a futuristic go-kart.

The price of the car, said to be available in Spring, has been set at the £400 mark.

Sprint fails tape

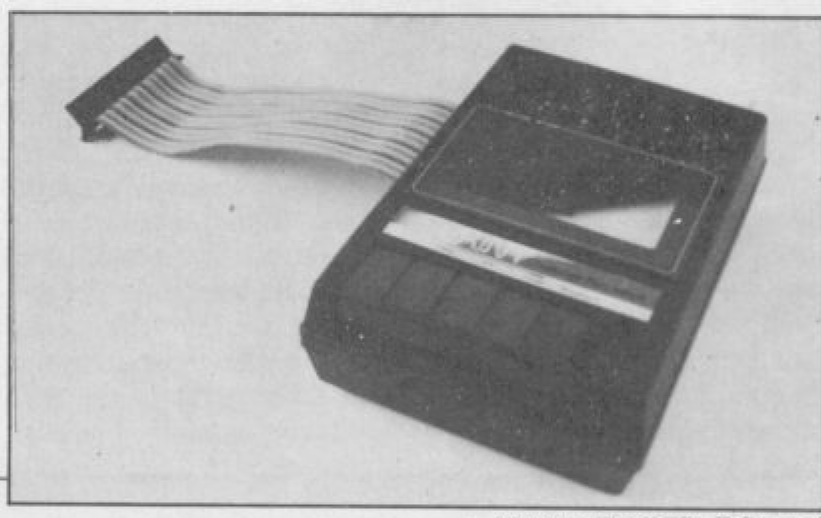
SPRINT, the high-speed tape recorder produced by Challenge Research, cannot cope with the new turbo-load and hyper-load software on the market, which has been recorded at a higher baud rate than normal.

Director A P Johnson says he is concerned about the situation, which has arisen since the Sprint was designed. At that time none of the high-speed systems were being used by software companies.

"Whilst the Mark II Sprint allows simultaneous use of an audio cassette player for turbo-load programs, this is not acceptable to customers who have paid nearly £70.00," says Johnson. "We are currently looking at several systems to overcome the problem."

In the meantime, the following software is known to be incompatible with the Sprint, **Strangeloop, Sherlock,** the new MikroGen range including **Pyjamarama**, and all recent Ultimate games.

Challenge Research has also undertaken to give "serious consideration" to providing information on compatibility in future advertisements for the Sprint.



Ket winners

NEARLY 2000 entries were received for the **Ket Trilogy** competition published in the November issue of *Sinclair User*. The 100 winners, who will each receive presentation packs of the three games, are listed below:

David Atkinson, Paull, North Humberside; Margaret Cunningham, Blackburn; Stephen Merrett, Fishbourne, Chichester; Neil Humphrey, Emsworth, Hampshire; J Dunstan, Bakersfield, Nottinghamshire; Maureen Goode, Walsall, West Midlands; Darren Williams, St Leonards-on-Sea, East Sussex; I Motton, Maidstone, Kent; H Jones, Rotherham, South Yorkshire; D Watson, Sheerness, Kent; W E Guest, Bootle, Merseyside; Sarah Jones, Orrell Park, Liverpool; David Rudd, Sheerness, Kent; R A Jones, Kirkby-in-Ashfield, Nottinghamshire; D I Emmerson, Dursley, Gloucestershire; Rosemary Oakeshott, Romsey, Hampshire; Naseem Ahmed, Luton, Bedfordshire; Alan Burton, Loughborough, Leicestershire; Brian Palmer, Sheldon, Birmingham; Chris Hatton, Selsey, West Sussex; S Clarke, Holmfirth, West Yorkshire; Derek Winsborrow, Teighmough, Devon; SSGT Spratt, 12 Armd WKSP, BFPO 36; N Bower, Chelmsford, Essex; Zoe Barnett, Todmorden, Lancashire; Brian Doggett, Kirton, Ipswich; David Burnett, Bradford, West Yorkshire; P Clarkson, Blackpool, Lancashire; S Glendinning, Sunderland, Tyne & Wear; Muriel Ramsay, Bradford, West Yorkshire; Steve Green, Ashby-De-La-Launde, Lincolnshire; Valerie Day, London E17; Amy L Charles, Cardiff, South Glamorganshire; David O'Connor, Dundrum, Dublin; David Wardle, Middleton, Manchester; Duncan Fortune, Taunton, Somerset; Jonathan Chadwick, Llaingoch, Holyhead; John Maclean, Bearsden, Glasgow; Syd Greig, Lydney, Gloucestershire; Kevin Morris, Guildford, Surrey; K D Baker, Bicester, Oxfordshire; T J E Brett, Canterbury, Kent; S Newham, Buzwell, Nottinghamshire; Robert Yarr, Partick, Glasgow; William Rowe, Littlemill, Nairn; S John, Mold, Clwyd; John A Murray, Killyleagh, Downpatrick; Srishna Sundaram, London SE25; Paul Grayson, Ripon, North Yorkshire; Mark Bowen, Ashford, Kent; A Wilson, Dundee, Angus; Daniel Minkin, Leeds; P H Vick, West Drayton, Middlesex; P Hipwell, Wymondham, Leicestershire; J M Benson, Deal, Kent; Peter Day, Wantage, Oxfordshire; I Greig, Hemlington, Middlesborough; John Bishop, West Bridgford, Nottinghamshire; K G Kerry, Peterborough, Cambridgeshire; Nicola Elsom, Saffron Walden, Essex; R V Scalglioni, London SW19; Jean Morris, Hove, East Sussex; J I McInnes, Benfleet, Essex; A R Hart, Wimborne, Dorset; Jean Simpson, Barrow-in-Furness, Cumbria; John Purkiss, Boston, Lincolnshire; Peter van de Zanden, Eindhoven, The Netherlands; Albert Filipson, Bradford, West Yorkshire; J Perridge, Chatham, Kent; Adam Arndt, Horsholm, Denmark; N Taylor, Crossford, Fife; Ian Ross, Basingstoke, Hampshire; A Griggs, Morpham, Kent; C J Allen, Dartford, Kent; T A Dowds, Greenfaulds, Cumbernauld; A Jones, Coventry; T A Walsh, Hucknall, Nottinghamshire; R C G Cook, Carlton, Nottinghamshire; M A Cobden, Emsworth, Hampshire; Gregory Giles, Sutton Coldfield, West Midlands; Edwin C Clark, Tavistock, Devon; Andrew Smyth, Berlin, West Germany; I McVicar, Littleholm, Clydebank; June Jowers, Pencader, Dyfed; Andrew Gash, Maryport, Cumbria; Roger Thomas, Pontypool, Gwent; K Richards, Runcorn, Cheshire; Paul Rutherford, Shildon, County Durham; Jeffrey Corbett, Pontyclun, Mid Glamorganshire; Vincent Gorman, Galashiels, Selkirkshire; A Bold, Runcorn, Cheshire; C Sleep, Plymouth, Devon; Paul Coleman, London SE3; A Bateson, Bradford, West Yorkshire; David Luscombe, Wallingford, Oxfordshire; J M Westley, Dunstable, Bedfordshire; Margaret Russell, Leicester; James Pollard, Plymouth, Devon; T G Brazier, Worthing, Sussex; D McMenamin, Strabane, County Tyrone.

more news on page 10



Have Spectrum, will travel

TWO new machines are being planned by Sinclair Research.

The most innovative is a portable version of the Spectrum which will boast inbuilt microdrive, 'proper' keyboard and flat screen display. The portable is the pet project of Sir Clive Sinclair who sees it as a move away from the games market which has been supported by its little brother. He admits: "It's not yet had the button pushed because we're still doing some work on the display".

The QL may also be joined by a big brother. The upgraded QL, which should cost £500, is likely to contain the Psion packages on inbuilt ROM which will mean that the microdrives can be used to store data only and each of the packages can be switched in at the push of a button thus reducing loading times.

An upgrade will be offered to former QL customers who will then have the advantages of the ROMs. Sinclair Research is aware of the problems that have been experienced with microdrives but strenuously denies that a new QL would be launched because of the business community's lack of faith in the device.

UK gets back on the Gold standard

UK GOLD, a new software company, is to bring a Seal of Approval to British Software.

Launched in January and masterminded by Geoff Brown from Centresoft, the company is approaching software houses with the aim of marketing and distributing their games.

With the present climate in the software industry, many companies have realised that they cannot afford to spend vast sums on marketing a product. At the same time, they are also finding it difficult to get their products accepted for distribution.

"Many companies are producing good games which have got lost in the rush of Christmas releases", says Brown.

When a game is taken on, the software company will be paid a fixed price for every game sold with UK Gold taking care of the advertising, packaging and distribution.

Each game will have the UK Gold seal of approval on the cassette cover but the company originating the game will maintain its corporate identity.

The plot thickens

THE PLOTS of best-selling novels are to be used in a series of adventure and strategy games planned by Hutchinson publications.

Doug Fox, general manager of Hutchinson Computer Publishing, says: "Hutchinson holds the book rights to a lot of big name authors and their use in software publishing is an obvious avenue for exploration."

The company already produces two Lonewolf games, from the books by Joe Dever and Gary Chalk.

Its latest project is **The Forth Protocol — The Game**, from the book by Frederick Forsyth. It is an adventure game which uses the latest in graphics techniques. Hutchinson is also considering other authors for the software treatment. Its shortlist includes Len Deighton, Gary Jennings and Ruth Rendell.

Calling all QL users

DETAILS of the Sinclair-approved QCOM communications package for the QL have now been revealed. The device, made by Spectrum VTX 5000 makers OE of Cumbria, will be available in three parts; the first is the £75.95 QCON unit, which contains software to run the entire system; the QMOD modem can be stacked on top of QCON and costs another £75.95; finally, for £49.95, an auto-call module called QCALL can be positioned atop the other two.

QCON, the software heart of QCOM, upgrades the meagre serial capacities of the QL such that ports can be independently configured to all the standard data rates between 75 and 9600 baud. The module also supports the VT100 communications protocol, giving the QL a valuable new role as a terminal to widely used minicomputers.

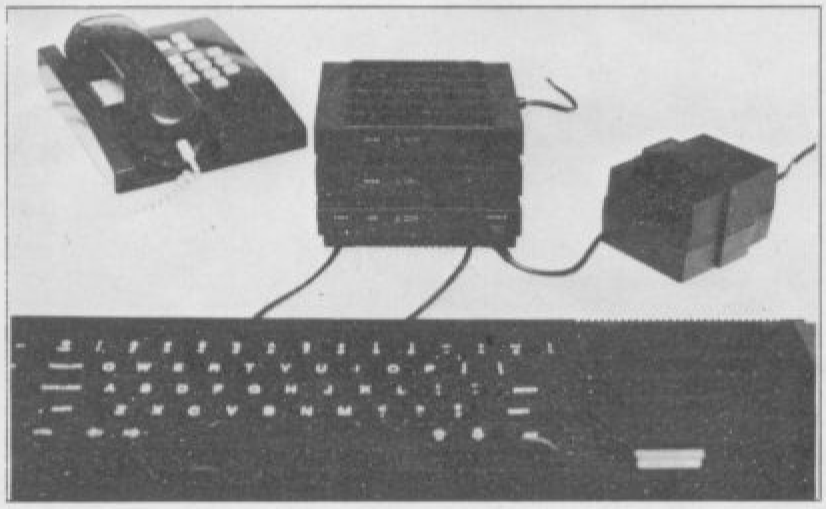
An RS232 port allows QCON to employ any commercially-available modem, but most users will prefer to remove a plastic plate on the upper surface of QCON to allow the stacking of the matching QMOD modem, a unit offering 1200/75 and 1200/1200 Prestel-orientated communications.

As an added luxury, the QCALL module allows look-no-hands operation of QMOD — even in the owner's absence — by installing an auto-dial and auto-answer facility under the software control of the QL.

The whole QCOM system is emphatically at the high quality/highish price end of the comms market, and OE boss Martin Ansell is well aware that other manufacturers are likely to leap in with cheap, modem-only solutions for the QL.

"We've deliberately aimed for the professional and educational sector with QCOM, people who can't afford corruption of their data with inferior systems."

An area of Micronet 800 dedicated to QL users has already been established, offering very wonderful news, features and software-down-the-phone; the latter feature will include OE utilities to expand the QL modem, and the software library of the Independent QL User Group.



Guinea-pigs complain

ONLY owners of new QLs and members of the £35.00 per year Sinclair-sponsored QLUB organisation get upgrades of the bundled Psion software. However, the emphatically non-Sinclair Independent QL User Group is encouraging its members to return QLs under the Sale of Goods Act, using their refund to buy a new machine with the improved programs.

Nigel Searle, Sinclair Managing Director, was unconcerned when I tackled him about the issue: "We'll have to look at individual machines and see whether they met the standards of merchantability at the time they were sold. We will test machines which come back; if they meet our criteria we're going to say, 'That's of merchantable quality, that's what you bought, that's what you got.

"I can understand how people who felt they must be first on the block to have a new product might then feel — if they have a machine with which they have problems — they've been used as guinea pigs. This certainly wasn't our intention, and I think that most people are realistic enough to know that if you wait until 1985 or 1986 or 1987, you'll get more value for your money.

"In any case, I'm not worried that the attitude of the Group is indeed going to lead to a massive return of QLs. We do regular telephone surveys and we find that most people are very happy indeed with the machines."

The chat with Nigel Searle took place at ICL's launch of its One Per Desk 'executive workstation', which employs much of the QL technology.

Sinclair has licensed GST, makers of the alternative 68K/OS operating system for the QL, as distributors of the QL board to hardware manufacturers who might want to incorporate it in other machines. But the ICL deal is not in that category.

"We're not selling boards to ICL," Searle explained. "They've used some of the components from the QL — notably some custom chips.

"They've also written their own operating system; although the OPD has the same sort of computing power as the QL, it's a great deal more besides, and they've written an OS to support that."

Plug-in pack for CP/M-80

WHAT IS claimed as 'the first product to transform the QL into a true business computer' has been launched by QL + Ltd of Esher.

The device is an add-on card containing a Z80 chip and 64K of RAM which plugs into the QL main expansion port and enables it to run software written for the CP/M-80 operating system.

CP/M-80 has the largest software library in the world, and this should now be portable to QL microdrive format — a task rumoured to be currently occupying the software arm of giant retailer WH Smith.

The card also boasts two software configurable 8-bit ports, with attendant 64K of print buffer space.

Due for imminent availability, the device will cost £199.



QL correspondent Sid Smith is news editor of Micronet 800

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Please send me ______ Adult tickets @ £1.25
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I enclose cheque/PO made payable to ZX MICROFAIR and I also enclose a stamped, self-addressed envelope for reply.
Post to Mike Johnston (Organiser) Dept SU, ZX MICROFAIR, 71 Park Lane, Tottenham, London N17 0HG.

15th ZX MICROFAIR 10am-6pm

Flexibility for Spectrum users!



56-way I.D.C. connector and ribbon cable assembly, designed and manufactured by Varelco Ltd., to fit the Sinclair Spectrum and Spectrum+ computers. Available in single, double-ended and threeway format. Also available, paddle board to convert female connector to male plug format.

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Ocean Software is available from selected branches of: **WOOLWORTH**, WHSMITH, Boots, John Menzies, LASKYS, Rumbelows, **COMET**, Spectrum Shops and all good software dealers. Trade enquiries welcome.

FIRST

THERE'S NEVER BEEN A BETT

★★★★★★★★★★★★★★

U.S. GOLD
All American Software

Until now, this fantastic range of American games has been available only to the fortunate owners of Atari and Commodore computers. Now, thanks to U.S. Gold, you and your Spectrum/ Spectrum + can team up with some of the best games available today, from such famous-name American software houses as SEGA,



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BUCK ROGERS £7.95

The Ultimate in American Software

Selina's man of wax . . .

SIR CLIVE is to get the wax treatment at long last from Madame Tussauds. For once, however, he will have to share the limelight. The great man's noble effigy will, apparently, be part of a tableau with Breakfast TV's **Selina Scott**. While **Clive** holds one of the pocket TVs as only he knows how, sultry Selina will stare over his shoulder. "I think he will take it in his stride," says a spokesman for the micro magnate, enigmatically . . .

News too of the **Clivemobile**, still shrouded in secrecy but due for a full sales launch in the spring. The *Mail on Sunday* recently published photographs of the vehicle, obtained by infiltrating the morning shift, climbing onto the roof and peering through a skylight. "The story was speculative throughout and grossly inaccurate in parts," says **Sinclair Research**. "Now you're going to ask what the truth is and we're not going to tell you." Thanks, boys . . .

Others who hide their proverbials under a bushel include **Virgin Games**. That masterpiece of flicker, **Sorcery**, surely one of the 50 best arcade-adventures from early 1984, contained a mystery competition. The first person to telephone a number on a hidden screen of the game was to win a trip to New York, doubtless on one of **'Biggles' Branson's** cheapo flights. Trouble was, nobody knew about the competition. Not to be outdone, Gremlin offers £1 million-worth of remaindered copies of **Sheepwalk** to the first person to spot the mystery competition concealed on this page . . .

The further activities of **St Bruce Everiss**, the former Diaghilev of Liverpool software, attract comment. The holy one has made a pact with **Oric** to distribute hardware from his new base at Cambridge, **Tansoft**, which specialises in Oric programs. Born-again Bruce intends to "establish the Oric Atmos in its rightful market position". Shouldn't be too difficult; after all, it worked for **Imagine** . . .

The alternative society is still throbbing at *Micro Arts*, the magazine Gremlin discovered in January. The high priests of pretension have now released *Micro Arts 2*, **Various Unusual Events**, a selection of programs on cassette. The events include the dire **Minimal**, which fills up the screen with dots very, very slowly, and **Dada**, which makes up words at random. Pride of place goes to **The Money-Work System** based on *The Scum Manifesto* by Valerie Solanas. Gremlin regards this as essential viewing for all neo-patriarchal non-feeling fascists, ie men, especially ones who cannot win at **Hampstead**. Buy the program, and learn why only "very young or very sick women" will endure male company without being "coerced or bribed" . . .

Coercion and bribery have certainly got nothing to do with the latest oddity from *Personal Computer News*. It was strange, all the same, to see **Ghostbusters** from Activision turning up on the *PCN* Spectrum Charts at number four more than a fortnight before the game was actually launched. Perhaps the Soho hacks get their news from the astral plane . . .

Not that it matters much, now that **Cheetah** has, in its own words, "completely destroyed the existing home computer software market". How was the feat accomplished? Surely not even CheetahSoft would dare to nuke **David Ward** of **Ocean**? No. The crafty cats simply lowered the price of **3D Bat Attack** and other ancient and generally unwanted games to £2.50. Cheetah claims it has always believed its products should be sold cheap, but nasty American companies had contracts to forbid it . . .

The spotty ones must be disappointed, however, to discover that **Domark**, publisher of the grossly over-hyped **Eureka**, and winner of the brazen backslappers of the month award, has promptly gone and resurrected the beast.

"The software industry is alive and kicking," says Domark, and all because it has sold 'thousands' of copies in the first few days of release to punters anxious to grab a piece of the £25,000 prize money. If Domark's sales projections are correct, and if nobody solves the devious puzzle, as seems likely, purchasers should receive the princely sum of 10p. About what the game is worth, says Gremlin . . .

Congratulations to **dk'tronics**, runners-up in the great **Spectrum+** compatibility race. "Was the new Spectrum+ designed with our peripherals in mind?" ask the black box specialists. "All our peripherals are fully compatible with the new Spectrum+". The answer is "No" . . .

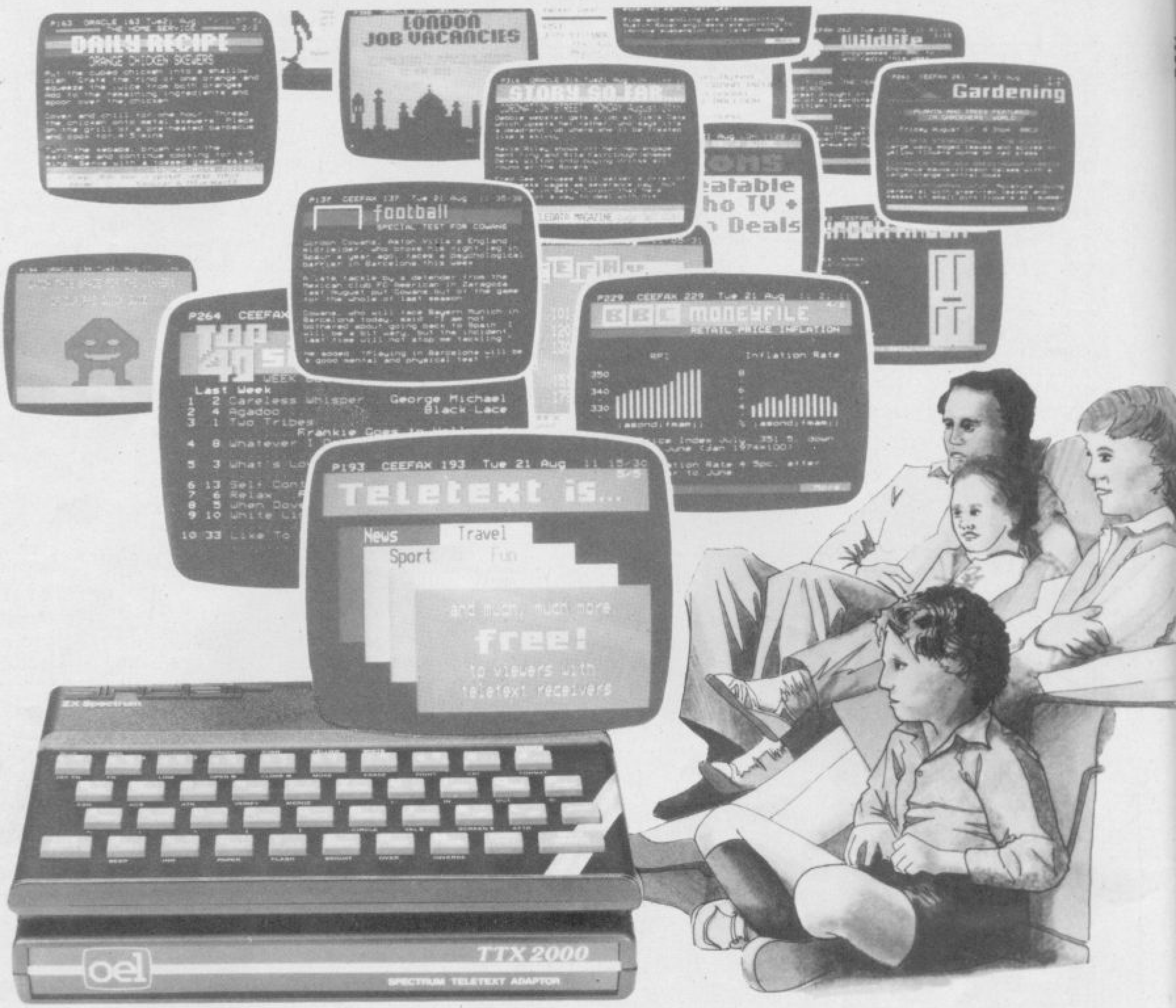
Finally, *Sinclair User* was delighted to receive news of a new range of health foods from **Only Natural**, namely a Muesli Bar and a 'nourishing' Sesame Snack. Why our magazine was singled out for such attention is a mystery, but the accompanying samples were duly consumed and evaluated. "It tastes like budgie seed," said **Clare Edgeley**. **John Gilbert's** reaction was unprintable, but he is, even at this moment, attempting to calculate his notorious factor for the confectionary section of Software Directory . . .



Tony Martinez, chairman of Microvitec, demonstrates the latest QL monitor at his new Bradford factory.



Professional Australian Rolf Harris, presenting the prizes in a Save The Children Fund painting contest, learns how to improve his music by using the Spectrum's awesome BEEP command. Julian Goldsmith of Sinclair Research grins and bears it.



A wealth of free information is yours for the asking with the TTX 2000 Teletext adaptor.

The new TTX 2000 adaptor lets you use Teletext in a way that's never been done before.

Now you can link together your ordinary T.V. and your standard Spectrum and call up a wealth of broadcast information on Ceefax and Oracle covering just about everything from news, sport, reviews and entertainment to competitions, financial advice, advertisements and consumer topics.

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*Supplied complete with power supply, interconnecting ribbon cable and full instructions.
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Raising the BEEP standard

THE Spectrum was launched nearly three years ago. At the time of its launch it was demonstrated to be very innovative and indeed proved itself worthy of praise.

What have we got now? Well, for £129 we can now get a machine with a huge software base and huge expandability. For the same price we could have bought a complete computer such as a Commodore 64, or an Amstrad CPC464. These machines are gathering large user bases and future innovative software will be for those machines because both have good medium resolution graphics, both have good sound facilities, and both have large user memories.

You may say that the good old Spectrum can match two out of three, and you would be right.

Good sound facilities on a machine will have an increasing effect on the popularity of games software. The Spectrum has long since struggled with its BEEP, but the only way forward for the Spectrum is to have a standard sound interface. No longer will the Spectrum be paralysed everytime a sound is made, and games software will improve 100 percent.

I recommend that the Fuller Box be accepted by us dedicated Spectrum users as our standard sound interface.

I G Moar,
Bangor, Co Down.

Lightning conductors

WE ARE in the process of forming the official White Lightning User Group, as recognized by Oasis software. We hope to provide an information and help service for the users of this Forth-based utility. We will provide information for users of **White Lightning** on the Spectrum 48K, the Commodore 64, the Amstrad and the MSX machines. Anyone requiring information on the group should send a sae.

T Kelly,
353 Merville Gdn Village,
Newtownabbey,
Co Antrim, N. Ireland
BT37 9TZ.

Portuguese penfriend

I AM one more of the Sinclair readers, which own a Spectrum 48K. I'm 17 years old and live in Portugal and would like to correspond with other Spectrum owners in English, French or Portuguese all over Europe.

Peter Paul,
Rua da Vinha No 2
2800 Almada, Portugal

Frogs of Midnight?

REGARDING Beyond Software's **Lords of Midnight,** do any of your readers agree with me when I say astounding graphics, but tactically speaking about as demanding as **Frogger?** Where does the challenge lie, beyond manipulating thousands of characters and the necessary cartographic skills?

Last, having shelled out the appropriate readies for a copy of the otherwise excellent **Melbourne Draw** by Philip Mitchell, Melbourne House, on the understanding it was the selfsame program which produced the acclaimed graphics in **The Hobbit, Psytron** and the not so acclaimed graphics in **Mugsy,** I find it hard to believe it is not possible to paint a picture – or Fill, if you prefer – more than one colour. How were the demo screens on the B side of the tape done? Pixel by pixel?

Doug Baxter,
London W14.

High flying Rocket Man

I RECENTLY purchased the highly acclaimed ZX-81 **Rocket Man** which is now my number one game. I do not understand the flying of the vulture on screen four. When you get onto the vulture's back and press the flap key the vulture only moves down thus making it impossible to collect diamonds. I hope someone can find a solution to this mystery. The highest score I have achieved is 30,327.

Ashley Morris, aged 13,
Grimsby,
South Humberside.

Up against a brick wall

I RECENTLY purchased **Wanted: Monty Mole.** I got on fine with it until I started to get good. On the sixth screen – including the bucket screen – you come down the rope, avoiding being crushed on the previous screen. You should see an axe, a genie, a cartwheel, a piece of coal and a solid brick wall, between Monty and freedom.

How do I get past? I've tried walking through, I've also tried to get over a thousand points, in vain.

Alan Scott, aged 11,
15 Walkynscroft,
Firbank Road, Peckham,
London SE15 2BZ.

Low down on Underwurlde

HINTS on **Underwurlde:** Always look for the bow first; then look for the sword; kill the large beetle with the sword; look for the torch; kill the minotaur with the bow; kill the devil with the torch; make your way to level zero; use gems to go down rather than using ropes; use ropes to swing into side-rooms; and if the eagle takes you up to a high level, where if you fell you would die, then stop firing.

A Brown and R Laverick,
Saltburn-by-sea,
Cleveland.

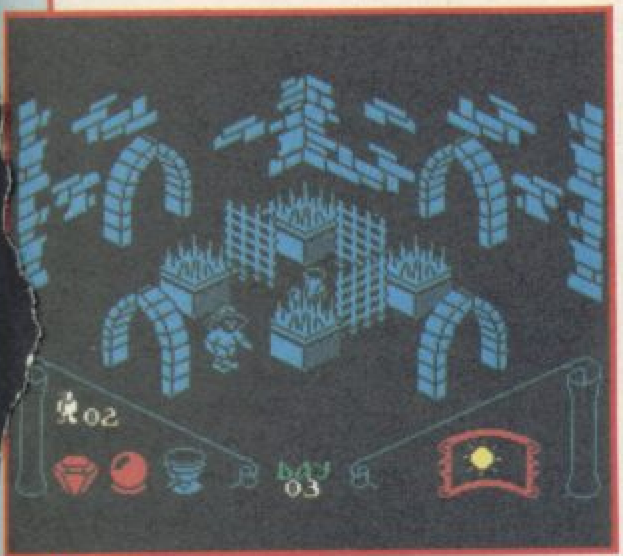
ZX-81: going, going, gone?

I FIND IT so thoroughly depressing to discover that even stores such as Dixons in Southend, who have retained the ZX-81 on their shelves for so long, have finally succumbed to the powers that be, and discontinued selling it.

I abhor the look one gets when a ZX-81 is mentioned in computer-based circles, as though they were rendered obsolete during the war. I have had my 16K '81 since February 1984 and it can now speak, when spoken to, play music of a sort, emit sound effects, and has a professional keyboard. I am currently in the process of fitting into the metal cabinet that houses the rest of it, the workings of a CB-type echo mike pre-amplifier to give the obvious effect. All that has cost me less than £90.

I do not feel that it is likely that I will ever need anything flashier than my '81. Apart from anything else, being one of the nation's UB40s I could not find it possible to afford even a 16K Spectrum.

At the moment, I am trying to teach myself the art of Z80-programming, and would be very glad to hear from any other poor soul in the same boat, especially from owners of Maplin Talk-back or sound generator modules, as apart from the obvious, I'm running out of ideas as to what to do with them. **Jim Cameron,**
312, Sutton Road,
Southend-on-Sea,
Essex SS2 5EX.



Knight Lore

A MORE sedate affair than **Underwurlde**, **Knight Lore** brings us a stage closer to true arcade adventure. Ultimate has devised a technique it calls 'filmation' to depict 3D graphics in quite extraordinary style. Sabreman has been cursed and must change at night into a werewolf. In order to lift the curse, he must find the correct ingredients to counter the spell and dump them in the wizard's cauldron. The wizard lives in a labyrinth of caves and chambers full of traps and strange guardians.

Each chamber presents a specific problem. Some are easy to negotiate, others difficult. A certain amount of imaginative thought may be required, and the judicious use of objects found in the network is recommended.

But it is the graphics which truly astound. The first time you discover that you can push objects around, climb up and down, and all without flicker or any loss of speed, you will be amazed. When you move behind an object, you pass out of view. Piles of blocks may hide terrible traps — you will only find out by leaping onto them and testing them.

As an added bonus, the position in which you start changes from game to game, so there are always new problems to face and new routes to discover. Although it is relatively easy to explore the maze, it is much more difficult to work out which objects you need or discover the ingredients for the curative potion.

In order to produce such advanced effects, Ultimate has had to use only one colour for each screen. Careful shading is used to create the detail which might otherwise be done in colour. The overall effect is of a crepuscular world of claustrophobic menace. Does that chest hide an important secret? Is the span of rock to the high arch safe or will it drop me onto the poisoned spikes? How can I climb a wall three times my own height? What is the old boot for? Those questions have been asked by adventurers for years. Now the arcade wizards can taste that kind of magic for themselves.

Chris Bourne

KNIGHT LORE
Ultimate
Memory: **48K**
Price: **£9.95**
Joystick: **Cursor, Kempston, Sinclair**
Gilbert Factor: **9**

Macman in the Treasure Caves

MACMAN in the Treasure Caves is a program designed to practice subtraction. Macman is a character dressed in a tartan suit who is used throughout a series of programs developed by Sinclair Research and Macmillan Education and programmed by Intelligent Software. This particular program deals with the second level of subtraction from level one (1-10) to level five (up to 41-50). The level can be set or will self advance according to the child's ability.

The object of the game is to gain treasure, the user is asked to find the difference between two numbers. When some answers have been given correctly, Macman can go to the caves and play an arcade type game while answering more questions.

The game is not very exciting, certainly not up to the standard of the Psion **Estimator Racer.** It is less flexible as it only tests subtraction, for the age group 4-8.

Theo Wood

MACMAN IN THE TREASURE CAVES
Sinclair Research
Memory: **48K**
Price: **£7.95**
Gilbert Factor: **6**

Boulder Dash

MUTANT diamonds, bone-crunching boulders, and deadly amoeba are just some of the ingredients which make up **Boulder Dash**.

You play the part of Rockford, an intrepid explorer who has just got lost in a string of underground caverns. Suddenly he notices something glinting in the darkness. Rushing over he picks it up and a boulder crashes down from above. Splat!

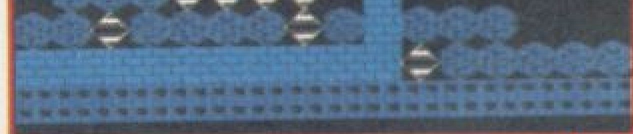
The idea is to guide Rockford through each of the caverns, collecting all the diamonds, in a set time limit which will gain him entry to the next cave. It can be tricky as each diamond lurks beneath a precariously balanced boulder — so look out.

In each successive cavern, the time limit is shorter and the tasks harder, diamonds when released will turn into poisonous butterflies, deadly amoeba has to be contained by dislodging boulders to form dams and you have to work out how to get past the fireflies, guardians of the jewels.

Boulder Dash was originally released in the States by First Star for the Atari 800. It was an instant hit and has been converted to the Commodore 64 and the licence bought by an arcade manufacturer.

According to Front Runner, **Boulder Dash** has been described as "one of the finest examples of Spectrum programming ever". Balderdash! Slow and jerky movement dog Rockford's every step making it difficult to pass through each cave within the time limit specified.

Although there are many features in the game including four interactive puzzles and five difficulty levels to each of the 16 caves your excitement can quickly turn to frustration when time and time again, Rockford is



bombarded by boulders.

Clare Edgeley

BOULDER DASH
Front Runner
Memory: **48K**
Price: **£7.95**
Joystick: **Kempston, Protek, AGF, Sinclair**
Gilbert Factor: **5**

more software on page 24



Underwurlde

FRESH from the jungles of **Sabre Wulf** the Sabreman returns, just in time to make pots of money in the Christmas rush. Ultimate has released two new games featuring the character, both with the superb graphics we have come to expect from the company, but different in conception.

Underwurlde is a sort of vertical **Atic Atac**. Sabreman is now given the ability to leap about the screen, and has a variety of weapons used as missiles. The task, as ever, is to escape. Monsters, which include evil plants, eagles, gargoyles, flying jellyfish and harpies which may actually carry you off, do not kill you as such but bounce you around the screen, knocking you off your perches.

The Underwurlde is a series of large chambers connected by chimneys. Fall too far and you will lose a life. To negotiate the climbs, you must either leap from perch to perch, or hitch a ride from volcanic bubbles, which steam up from craters on the lower levels. It is often easier to descend to the caverns in order to rise.

The game is extremely fast and colourful; those braggart voices which claim previous Ultimate productions are too easy will find life in the Underwurlde is no picnic. You will need to find the right weapons to deal with special foes, work out a route to the open air, and all the time maintain a ferocious pace of reactions and nimble movement to avoid disaster.

Chris Bourne

UNDERWURLDE
Ultimate
Memory: **48K**
Price: **£9.95**
Joystick: **Cursor, Kemptons, Sinclair**
Gilbert Factor: **8**

Jasper

HEY rat fans, Roland has a competitor in **Jasper,** a 22 screen arcade game which is about as much fun as bubonic plague.

In this overland, and overhyped, version of **Manic Miner** Jasper has to jump and crawl through assorted obstacles, such as yellow bears and spiders, collecting treasure chests and money bags which grow on trees. The bags give the furry rodent energy and extra lives, all of which you will need to get through even the first three screens.

On novelty which is not available in **Manic Miner** is that you can move off both edges of the screen into other scenarios without scrambling through exits. The game is not mapable as we found when we went off the first screen with its bionic bunny to a prowling wild cat. Moving back to what should have been a rabbit screen disclosed a new format with yellow panthers. Confused?

The game is not compatible with joysticks, or at least does not proclaim their use on the cassette insert. Once loaded the computer launches into a demo mode and no joysticks show up there either. **Jasper** may only require a few control keys to play but it is an obvious candidate for joysticks and it is amazing that they are not included.

John Gilbert

JASPER
Micromega
Memory: **48K**
Price: **£6.95**
Gilbert Factor: **6**

Wordsetter

WORDSETTER forms part of the Learn to Read series produced last year by Sinclair and Macmillan. The accompanying booklet has plenty of tips for parents emphasising the enjoyment of the activities.

Theme is a card game for two players. The theme is displayed over two sets of six cards — at the zoo, food and so on. The game operates on two levels, either a picture and word or word only appears at the bottom of the screen and the players have to decide whether it belongs to their theme, and press 1 or 0. If correct, a card is turned over. The first player to turn over six cards wins, but if a key is pressed uncorrectly the player loses a card.

Order is concerned with putting sentences in their correct order. The sentence appears at the top of the screen jumbled up with each word numbered. The child has then to complete the sentence by pressing the correct numbers.

Theo Wood

WORDSETTER
Sinclair Research/Macmillan
Memory: **48K**
Price: **£7.95**
Gilbert Factor: **7**

Tachyon Command

IN THE fabulous super-fast **Tachyon Command** you are invited to kill wave upon wave of aliens. Two waves in fact. The first lot are Galaxian-type invaders which drop bombs. The second lurk in a tunnel and come at you one at a time. If you beat the tunnel aliens you get the first lot again.

No, wait. There are original points to **Tachyon Command**. In the first place, you get six ships. So what? you ask. But in fabulous super-fast etc etc you can have them ALL AT ONCE! The six ships sit in a pyramid formation at the bottom of the screen all firing away. If you do not hit something you must be pretty dumb.

The fabulous super-fast ships look like little white triangles. The romance of being a collection of little white triangles lost in a distant galaxy was clearly a strong selling-point for Century Software.



Fabulous etc Software should have stuck to selling superpriced books about programming. At least the public would have been spared the sorry saga of the super-fast eternal triangles.

Chris Bourne

TACHYON COMMAND
Century Software
Memory: **48K**
Price: **£6.95**
Joystick: **Kempston, Fuller**
Gilbert Factor: **2**

more software on page 26

O'LEVELS

not just revision but also tuition

MATHS 8 programs TOTAL 150k	fractions, square roots, decimals, logarithms, areas, sets, accuracy, bases, interest, volumes, indices, standard form, modulo, number sets, pie charts, histograms, simultaneous equations, bar charts, averages, probability, algebraic laws, quadratics, matrices, vectors, transformational geometry, trigonometry, differentiation, integration, factors, angles.	Spectrum 48k ✓ BBC model B ✓ Commodore 64 ✓
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BIOLOGY 6 programs TOTAL 120k	plant and animal cells, genetics, inheritance, reproduction in man, asexual and sexual reproduction, flowering plants, photosynthesis, osmosis, transpiration, transport, bacteria food classes, diet, alimentary canal, respiration, excretion eye, skin, nervous system, ecosystem, food cycles, fungi earthworm, amphibians, birds, mammals, response.	Spectrum 48k ✓ BBC model B Commodore 64
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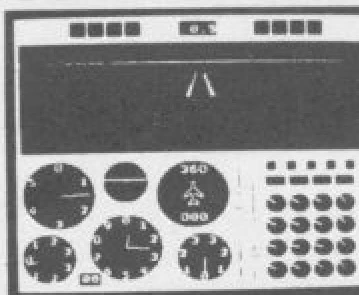
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★ ★ NEW—FOR THE SPECTRUM 48K ★ ★
direct from DACC the simulation specialists

747 FLIGHT SIMULATOR



picture shows BBC/B version (2 colour)

DACC has already produced six immensely successful Jumbo-Jet Simulators for the Dragon-32, BBC/B, Acorn Electron, Tandy c/c, Atari and Commodore-64 computers. Now, with even more features, it is available to SPECTRUM 48K users. You may have tried a light aircraft game but nothing compares to the excitement of flying and landing a huge 747, carrying over 400 passengers and weighing up to 370 tons (fuel load is variable).

LOOK at these features on your Spectrum version.

★ full colour high-resolution graphics
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Can be used with suitable Joystick (Simulating arrow keys), or without Joystick.

All the 747's main instruments are shown in precise detail, as real dials, some also having inset "rolling-digital" display, as per prototype.

Pre-distribution copies available now, in good time for Christmas, send cheque or PO for immediate delivery.

Cassette £9.95 (including VAT, P&P)

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LOTHLORIEN

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Telephone: 0625-876642



1944 Battle of the Bulge
To celebrate the 40th Anniversary of this American Victory, Lothlorien have launched PANZER ATTACK. All graphic, 1 player wargame. Real time action, full instructions and tactical hints in the program.

Spectrum 48K £5.95

NEWSFLASH

REDCOATS (1 or 2 player wargame) for Spectrum is now MICRODRIVE COMPATIBLE — save battles to your Microdrive.



Multicoloured animated graphics Realistic tunes and sound effects. Five levels of play. Cast of thousands (well 14 actually — see us on the cover).

I was out walking wiv me Sheila in the Outback, when this'ere Flying Saucer came out of the bush. At first I thought it were a hoard of pommie tourists, but as they got closer they looked more like joeys. I took a swill of amber brew, a bite from me tucker, and set to wiv me boomerang.
How about some help Cobber? Even a pommie is better than nothing (just)!

Redcoats	Spectrum	£5.95
Master of Serebal	Spectrum	£6.95
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LOTHLORIEN, MORE ACTION FOR YOUR MONEY

Estimator Racer Number Painter

TWO new programs by Psion and ASK, designed to improve mental arithmetic, mix arcade action with a mental workout. **Estimator Racer** takes the form of a car rally, at first on clear roads, then with hazards, and some night driving before the end.

A sum appears at the bottom of the screen and you have to steer the car into the lane labelled with a number nearest the answer.

If you are not in the correct lane at the half kilometre mark you are stopped and gently reminded. All that wastes time, of course, and the object of the game is to finish the rally as fast as possible.

Four types of car can be chosen, and a practice rally of any part of the game. You can choose any kind of sum, + − * /, and of course the faster the car the harder the sum. At 300 kph the half kilometre mark happens rather too often.

Number Painter is a similar program using a ladder game. You are given a target number and then have to reach the target from your start number. Various numbers are dotted round the screen, +4, *7, −3, /5, and the object is to paint out those numbers until you reach the target. There is a choice of painting gangs to vary speed.

Theo Wood

ESTIMATOR RACER
Psion
Memory: **16K**
Joystick: **Not specified**
Price: **£4.95**
Gilbert Factor: **8**

NUMBER PAINTER
Psion
Memory: **16K**
Joystick: **Not specified**
Price: **£4.95**
Gilbert Factor: **7**

Ghoulies

GHOULIES isn't about what you think, so stop sniggering and pay attention.

Long ago a wicked monk got up to some very nasty business. The Inquisition tried him but he would not spill the beans. His secret now lies in the ruins of an ancient labyrinth, along with some treasure and a lot of extremely unpleasant psychic manifestations — ghouls, ghosts and all the other things that go bump in the night. The locality is terrorised by such creatures. Your job is to seek out the hidden truth and to survive.

Ghoulies is a text adventure which looks like it was written on the Quill but features some fancy graphics. Those occupy the top few lines of the screen and are colourful and very well drawn. They are also almost instantaneous and waste no time.

The descriptions are reasonably detailed and there is a fine sense of atmosphere in the game. That is intensified, not interrupted, by the graphics. The general presentation alone is enough to make you want to play whilst the plot is intricate and riddled with hazard. You will get a good picture of a superstition-ridden late medieval village, with its apothecary, alchemist and hostile locals . . . not forgetting the ruinious abbey and its dark, foreboding crypt. IMS deserves a pat on the back for this attractive and well made program.

Richard Price

GHOULIES
IMS Software
Memory: **48K**
Price: **£7.50**
Gilbert Factor: **7**

Runes of Zendos

DORCASIA, like Camelot, was a fairly well regulated place until the evil Zendos threw the main switch and plunged the country into perpetual darkness. The 'spirit' of each month of the year was trapped in a secret rune and then tucked away in the depths of his castle.

As might be expected you must search the castle and destroy the hour glasses which hold the months. There is also a runic inscription on each glass and you must decipher that to exorcise the spell on the month.

As there are 12 months there are 12 separate quests, all of which interlink



to some extent. To solve the full puzzle you must break a number of codes and the game becomes more difficult as you progress.

Like its predecessor, **The Oracle's Cave,** the game features animated graphics. The explorer walks and climbs from location to location encountering various monsters and magical objects. Those are finely drawn in attractive colour and are an improvement on the Cave's rather monochromatic pictures.

Text can be used as in a standard adventure and the buffer will accept reasonably complex sentences, including some adverbs.

The Runes of Zendos is carefully produced and will have considerable appeal to amateur cryptologists.

Richard Price

RUNES OF ZENDOS
Dorcas Software
Memory: **48K**
Price: **£7.95**
Gilbert Factor: **6**

Clown Highwire

ENGLEFIELD Software has produced a series of programs designed for use in schools. Those adopt the top down approach where the teacher is fully in control of the activities, and after a set of exercises is completed the message appears on the screen 'show page to teacher'.

Clown helps with sound blends presenting a gapped word such as l . . ther, and a choice of three blends to use, for example, ea, ie, ee. The word has to be typed in, and if correct part of a clown's face is built up.

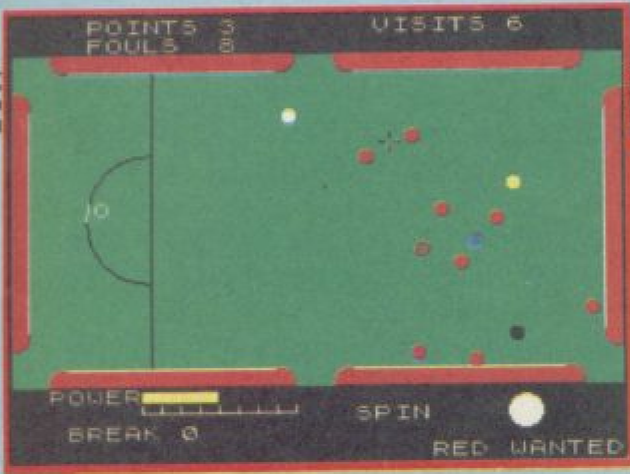
High Wire tests knowledge of tables given a choice of table and speed level. If the answer is correct an acrobat starts to walk over a high wire. If incorrect he falls off.

The graphics used for letters and pictures are basic and rewards are not very exciting. Progress such as these are exactly the same as worksheets and may be useful to save paper, but present no significant advance. They may have a place in remedial classes where constant repetition of tasks is important.

Theo Wood

CLOWN/HIGHWIRE
Englefield Software
Memory: **48K**
Price: **£6.25 each**
Gilbert Factor: **4**

more software on page 29



Steve Davis Snooker

COMPUTERS being, supposedly, very good at mathematics, it is not surprising that a plethora of Pool and Snooker simulations have been produced. Capitalising on the rent-a-star concept behind **Daley Thompson's Decathlon**, CDS Micro Systems has released **Steve Davis Snooker**, complete with a cassette insert portraying the wonder sizing up a likely pot.

The game is not at all bad. The screen displays an overhead view of the table. To play a shot, you move a cross-hair sight to a point on the table through which you want the white ball to pass — the point does not have to be next to another ball, giving scope for several styles of lining up shots.

You then set the power, and indicate on a large picture of the white ball where you wish to strike it, allowing the player to use spin shots if desired.

The geometry of the program, and the way in which spin is taken into account, is more realistic. It will take about as long to line up your shot as it takes Cliff Thorburn to play a simple stroke, but then snooker is not the fastest sport around anyway. On average a frame should take half an hour, about the same as in real life.

Problems occur however with foul shots. Although the correct penalties are awarded and the option to take the shot or put the player who fouled in again is there, there is no provision for a free ball. Nor does there appear to be any recognition of a touching ball.

The pockets are large, although that does not mean you will find it particularly easy to build large breaks. Positioning of the cursor can be done by keyboard or joystick, and there is an acceleration factor so that one can make fine adjustments without taking ages to move the cursor from one side of the screen to the other.

Chris Bourne

STEVE DAVIS SNOOKER
CDS Micro Systems
Memory: **48K**
Price: **£7.95**
Joystick: **Cursor, Kempston, Sinclair**
Gilbert Factor: **7**

Lode Runner

ANOTHER ladders and levels game you cry, as you aim **Lode Runner** at the dustbin ready for the drop.

But, however, there is something extra which makes the game different from the rest. Once you have run up the ladders, swung from poles and picked up gold bricks while dropping the enemy into freshly dug holes, you can switch to Edit mode and change the positions of all moveable objects on any of the 150 screens. You can even switch levels around so that, for instance, level one could become level four at the touch of a key.

Redesigning a screen is as simple as moving a cursor. You first select the object which you want to deposit on the screen. It can be a gold bar, or even yourself. Moving the drop cursor and pressing the fire button will put it on to the new set up.

As for the rest of the game, you might just as well forget about it. The user definition is the most exciting aspect of it and anyone who can work their way through 150 screens of matchstick heroes deserves a prize for perseverance. *John Gilbert*

LODE RUNNER
Software Projects
Memory: **48K**
Price: **£6.90**
Joystick: **Kempston, Sinclair**
Gilbert Factor: **6**

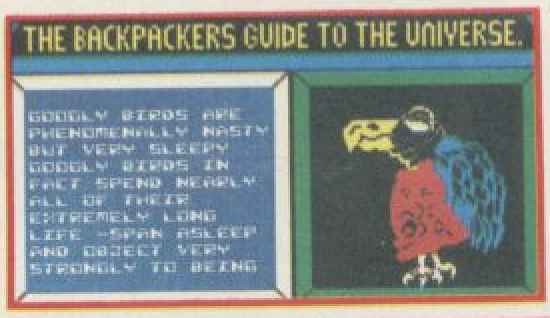
Backpacker's Guide

MEET Ziggy — again — as he takes on the role of a metagalactic zookeeper. Having found the dread Scarthax is out to pull the plug on the universe, our hero is visiting Thallis, Planet of Exile. Here are assorted caged monsters who may prove some use against the great adversary.

Caverns measureless to man stretch out in screen after screen of graphics and poor Ziggy, bless his little backpack, has to go round getting the beasts and returing them to his module back at the entrance.

The reverse of the cassette contains the Guide itself which describes a variety of mainly unpleasant beasts such as the Pricklepuss.

Dedicated followers of Ziggy are



bound to enjoy it and the tasks are complicated without being impossible. Those not so dedicated may find it all a yawn.

If you can't manage to get the animals back to your module you can always see how many screens you can get through. It numbs the brain after a while and should appeal strongly to ashen-faced arcade freaks. *Richard Price*

BACKPACKER'S GUIDE TO THE UNIVERSE
Fantasy Software
Memory: **48K**
Price: **£7.50**
Joystick: **Protek, Kempston, Sinclair.**
Gilbert Factor: **6**

Pitfall II

DO YOU ever get that sinking feeling? Seven flights of flickering yellow ladder and a cold bath in a subterranean river should be enough to give you the shivers, and that is about all you will get from **Pitfall II**.

A gigantic playing area of straight tunnels and dead ends, peopled by fuzzy white bats, dwarf condors, and spermatozoic sea snakes awaits you, as you guide Pitfall Harry on his quest to rescue Rhonda, his niece.

Control is not easy, and when Harry reaches ladders and pits he falls at a frightening speed. You must keep holding the joystick to the right or left and watch him inch sideways as he plummets, hopefully avoiding bats and finding a safe ledge before he hits the bottom. There is clearly scope for strategy here, but there is so little you can do to avoid the nasties that the exercise will probably become boring long before the problem is solved.

Chris Bourne

PITFALL II
Activision
Memory: **48K**
Price: **£7.95**
Joystick: **Sinclair, Kempston, Cursor**
Gilbert Factor: **5**

more software on page 32

Doomdark's Revenge

THE STORY so far . . . an icy chill has crept into the hearts of the people of Midnight. It emanates from the black towers of Icemark, domain of Shareth the Heartstealer, daughter of Doomdark and captor of Morkin, son of Luxor the Moonprince.

Luxor, with his hundred-fold army, has once again to fight the dread might of Doomdark's wizardry. He passes through the gate of Varenorn, opened by Rorthron the Wise, into the desolation of the chilled lands of Icemark in search of his kin.

To the north-west lies the kingdom of the Giants, to the east the Dwarfs and to the south the barbarian lords and the Fey, faithful to Luxor's cause.

In the north-east lies Shareth whose reason for revenge is personal. She wanted to murder her father and claim his power but Luxor got there first.

At the start of the game Luxor can control the other characters, which include Tarithel, the author's token woman and Morkin's betrothed. Each character moves through the landscape fighting enemies and building armies as in **Lords of Midnight.** Not much more can be said about the plot of the game but the technical excellence with which it is programmed makes it a cut above its predecessor.

You can find more than 128 characters while roaming through the beautifully drawn landscapes. Those may turn out to be friends, treacherous friends, or enemies. Be wary of your loyal subjects — their hearts may have been stolen by Shareth.

In the **Lords of Midnight** one criticism of the game was that you could not enter the citidels and other buildings. In **Doomdark's Revenge** you can. At first the darkness, illuminated by well animated guttering torches, is sufficiently different to make underground travel interesting but when you have been through several of those passages you may decide to stay above ground no matter what the dangers. The author hopes to give more variety to interiors in the finale of the trilogy but, until then, you will have to put up with danger in the dark.

One of the major differences in **Doomdark's Revenge** again concerns characters. When you call up a character you can see their emotional make-up, loyalty and state of mind. If they are tired they will not move.

The speed of the program is impressive. The period between the fall of night and dawn has been shortened and the speed at which the graphics are drawn seems to have miraculously grown.



The combination of strategy and adventure which the game provides surpasses everything that has gone before in both markets, and that summing up includes even **Lords of Midnight.** The author has yet again hit upon a winning combination in a game which should take its place in computer history in record time.

John Gilbert

DOOMDARK'S REVENGE
Beyond Software
Memory: **48K**
Price: **£9.95**
Gilbert Factor: **9**

Potty Pigeon

COLOURFUL scenes and excellent graphics ensure that Potty Percy is not just another flying pigeon pie in the sky.

Potty Pigeon is a proud papa, but his hungry young brood keep him busy searching for food. There are 11 locations where Percy will find big juicy wriggling worms. His baby feeding missions are hampered by lots of nasties determined to stop Percy including a big fat spider who swings from the tree where the chicks are nesting, a red bird that will steal the worms from Percy, giant killer Venus snapdragons, speeding traffic, helicopters and many more. Percy is also in constant danger of flying out of energy, which can only be replenished by resting on the ground or eating the mayflies.

Percy is no ordinary pigeon. He can perform counter-attack raids on the enemy by dropping deadly exploding eggs, which will score him points.

Progress is slower on the first level, but percy vere! There are a total of five levels and as you score points you will move into the higher levels, of which they are five.

The game is a delight to play. Although not as graphically complex as other games it will hold your interest with its gently addictive quality. Beware though, this game is not for crawlers.

Colette McDermott

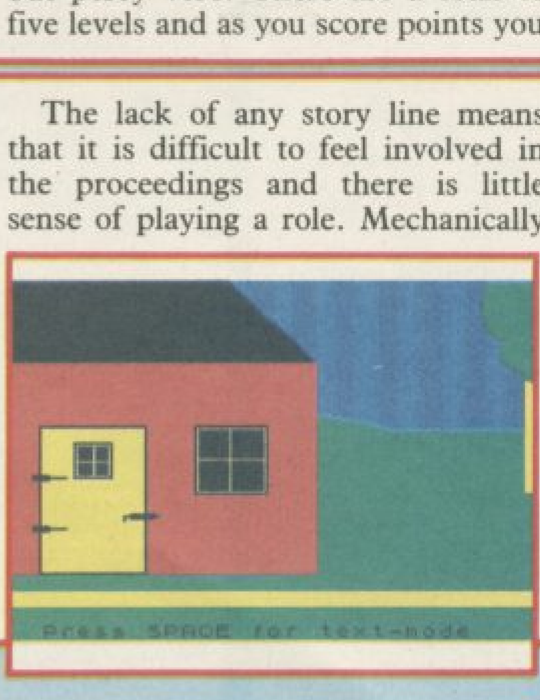
POTTY PIGEON
Gremlin Graphics
Memory: **48K**
Price: **£6.95**
Joystick: **Kempston, Sinclair**
Gilbert Factor: **6**

Waydor

ACCORDING to the instructions, the purpose in **Waydor** is simply to collect a set of treasures and return them to their proper place. The game is set in a fairly undefined world of villages, castles and rolling hills and there are the obligatory underground labyrinths. A few monsters are thrown in for good measure.

The game uses location graphics, which add little to the 'plot' and you are constantly treated to a redrawing of the picture if you enter Look.

The lack of any story line means that it is difficult to feel involved in the proceedings and there is little sense of playing a role. Mechanically searching, examining and moving is all very well but the process tends to come fairly automatically to most experienced adventurers. If you are to feel part of a world and a process of discovery you will expect to get detailed description and scene setting. Don't look to **Waydor** for this.



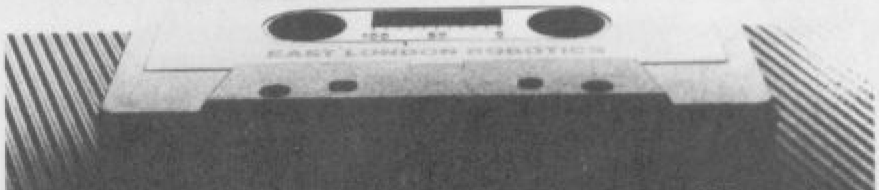
Richard Price

WAYDOR
IMS Software
Memory: **48K**
Price:
Gilbert Factor: **3**

more software on page 36

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Is the manual past chapter 24 a mystery to you? 'Beyond Horizons' shows 48K Spectrum users how to PEEK and POKE systems variables, how to manipulate the display file, how to control the attributes, how to find out how much spare memory is left and much, much more. With the SP48 this program is free. On its own, £4.50.

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48/80 FORTH

This compiler and editor is fast becoming recognised as the most professional and highest quality implementation of the FORTH language on the Spectrum. FORTH gives you the speed of machine code without the tedium of machine-code programming.

All the Spectrum's excellent graphics commands are retained including DRAW, PLOT and CIRCLE. Real arcade quality sounds can be produced using BEEP.

More advanced FORTH programmers will find that 48/80 FORTH provides a complete implementation of FIG-FORTH, including the sophistications of BUILDS, DOES and CODE.

Each 48/80 FORTH cassette includes a separate FORTH editor which uses part of RAM as if it were disk. The 48K Spectrum allows a 16k RAM 'disk', while leaving nearly 20k of dictionary space. A comprehensive user-manual is also included, which covers both compiler and editor, and has a lucid beginners introduction.

Extensions to 48/80 FORTH will shortly be available to existing customers at a nominal charge. These will include floating point arithmetic, and microdrive handling.

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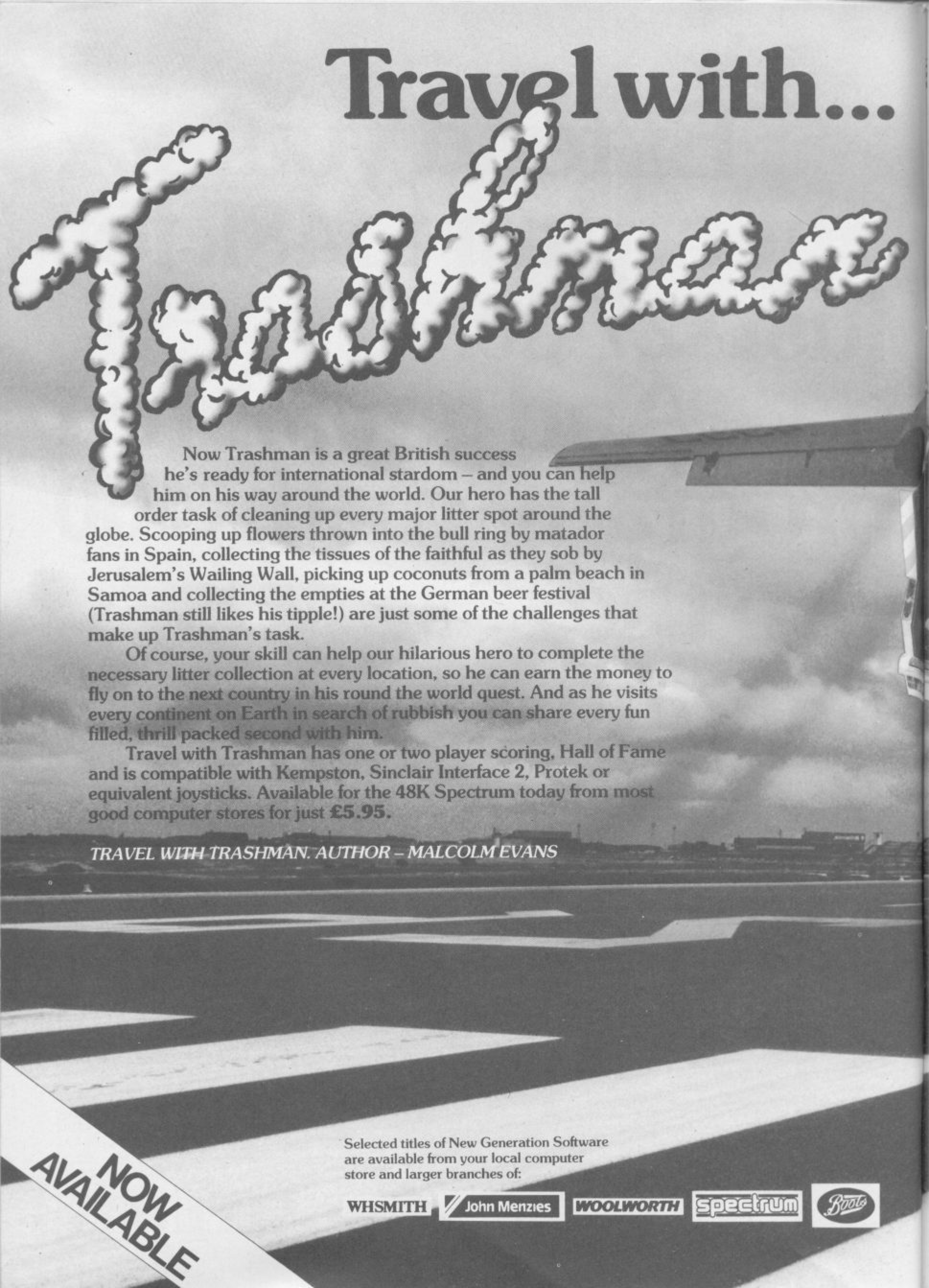
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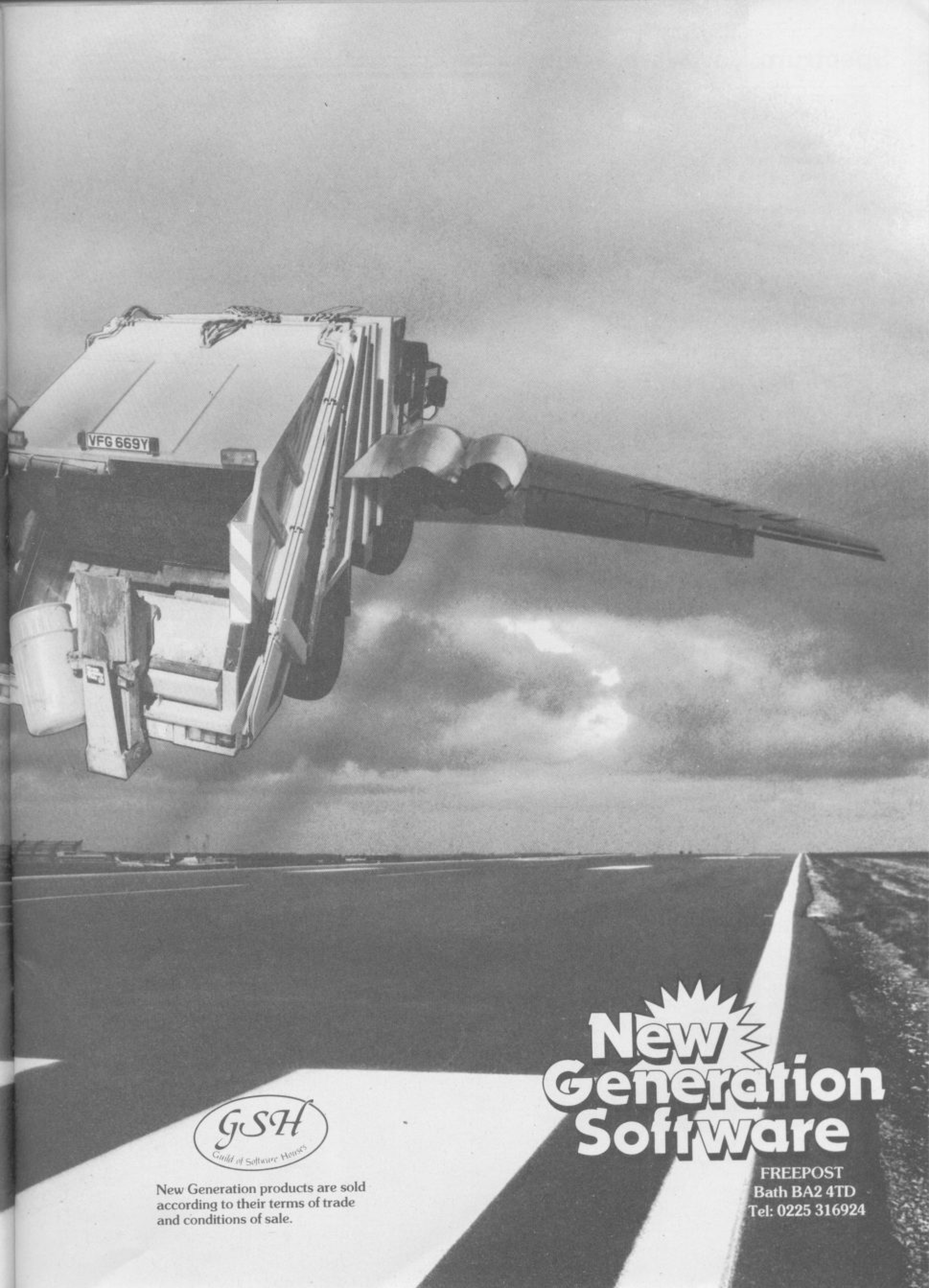
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Of course, your skill can help our hilarious hero to complete the necessary litter collection at every location, so he can earn the money to fly on to the next country in his round the world quest. And as he visits every continent on Earth in search of rubbish you can share every fun filled, thrill packed second with him.
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Legend

You may need a fork-lift truck to carry away **Legend** from Century Software. The game comes in a vast video style box containing a thick novel, a map, keyboard overlay and the cassette..

The program is in two parts. The first is an adventure game which is mainly menu driven with a graphic combat sequence in real time — nearly, anyway. Your role is that of Rek the Reluctant and your task is to search the land of Drenai for warriors to defend the inhabitants against the relentless and terrible Nadir hordes. On your way you must also solve a number of sub-quests.

There is very little text input as most options are chosen by single keypresses.

The second part of the game depicts the siege of Dros Delnoch, where you have taken the warriors you recruited in the first half. That section is a graphics strategy game and some rather spindly soldiers are shown against a backdrop of battlements.

The combat sequence adds little to the game and is mainly a matter of reflex — a warrior is shown flailing his sword around and when it stops you must choose from different types of thrust. The siege may well appeal to strategy fans but can easily become tedious after a time and could not be called addictive. *Richard Price*

LEGEND
Century Software
Memory: **48K**
Price: **£14.95**
Gilbert Factor: **6**

The Prisoner

SURVIVORS of the 60s will remember the excitement generated by the first showing of *The Prisoner*.

The recent rerun of the series has recruited new worshippers for an already popular cult and it's no surprise that there is now a computer adventure based on the show.

The game is set in the strange village where the inhabitants are known only by their numbers. Naturally enough you take on the role of Number 6 and former spy. Should you try to escape by building a boat? All the materials are there. Should you try to fathom the dark secret behind the village?

Enigmas sprout like mushrooms and you may find it difficult to grasp some of them if you have never seen the films. Some knowledge of the chaotic plot will certainly be to your advantage.

The program is written with the Quill but uses some graphics for the locations and this brightens the presentation considerably. Response time is fast but there seemed to be far too many 'I can'ts' in the replies and an unnecessarily limited vocabulary — a bottle of whisky could not be reached by entering 'get bottle', only by using 'whisky'. It is available from Spoof, at 58 Railway Road, Urmston, Manchester M31 1XT. *Richard Price*

THE PRISONER
Spoof Software
Memory: **48K**
Price: **£5.50 inc p&p**
Gilbert Factor: **6**

Love Oracle

DOES my partner love me? What can I do to put things right? Those are some of the questions answered in **The Love Oracle** and they do not refer to the relationship you have with your computer.

The package contains a book and a program. The book is based upon the Chinese oracle, the *I Ching*, devised by the ancient Chinese sages to answer questions on any conceivable subject. This new version devotes itself entirely to the love oracle of friendship, love and marriage.

While the book is packed with interesting and complex hexagrams, together with detailed instructions, the program contains only a limited version of what is in the book.

Having loaded the program you move straight on to throwing your coins, which the program is happy to do for you. There are no instructions to explain what is happening, making the book essential reading.

The program now tells you the title of the hexagram(s) you have drawn. For the first you read only the lines, for the second you consult any, or all, of the eight questions. By pressing whichever key you are instructed to for the lines, an answer will appear. With the hexogram Dynamism, the line drawn read 'Find help to change yourself'. The book goes into detail with an answer over six times as long.

All the questions and replies in the program are brief in comparison with the book. When you consider that the book alone is half the price of the program it does not seem to be very good value, but there again if you 'believe' then you will probably want to have it for your collection.

Colette McDermott

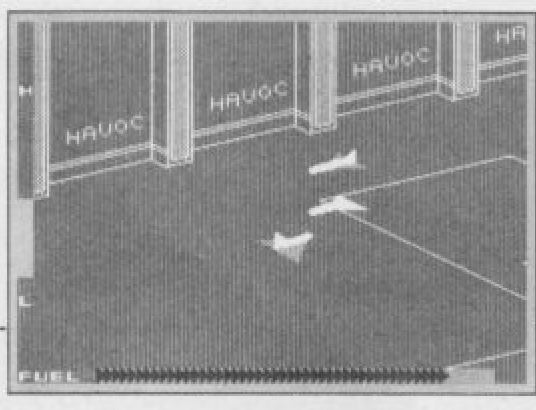
LOVE ORACLE
Solar Publishing
Memory: **48K**
Price: **£14.95**
Gilbert Factor: **5**

Havoc

HAVOC may well have been wonderful on the CBM 64 but the Spectrum version, far from being stunningly realistic as advertised, is just stunningly shoddy.

The game takes the **Zaxxon** format and you must pilot your intercepter over walls and through groups of pillars and other obstacles. The aim is to shoot down incoming cruise missiles and get fuel along the way by blowing up fuel dumps.

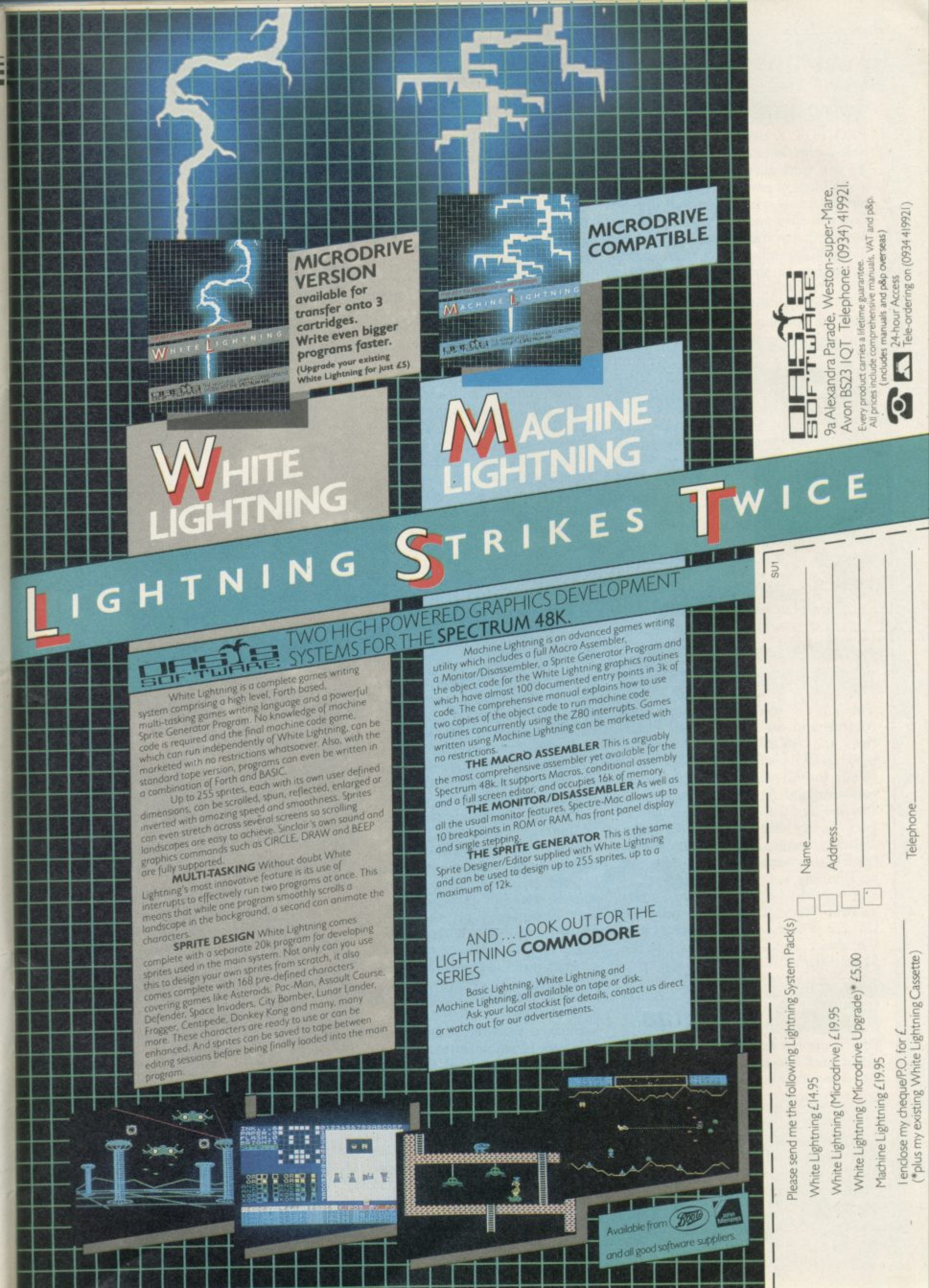
Given the current state of the art the graphics are dreadful — there is little use of colour and the scrolling landscape flickers and jerks along. The plane and the missiles look more like doodles and become almost invisible when they pass across bits of skyscrapper in similar shades. There is no detail in the general design and the whole program has the air of a rushed job.



Dynavision should wake up and realise that Spectrum owners now expect a lot more for their money and won't be palmed off with this abysmal rehash of a famous game. Serve with chestnut stuffing and cranberry sauce. *Richard Price*

HAVOC
Dynavision
Memory: **48K**
Price: **£7.95**
Joystick: **Kempston, Cursor**
Gilbert Factor: **2**

more software on page 38



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OASIS SOFTWARE
White Lightning is a complete games writing system comprising a high level, Forth based, multi-tasking games writing language and a powerful Sprite Generator Program. No knowledge of machine code is required and the final machine code game, which can run independently of White Lightning, can be marketed with no restrictions whatsoever. Also, with the standard tape version, programs can even be written in a combination of Forth and BASIC.
Up to 255 sprites, each with its own user defined dimensions, can be scrolled, spun, reflected, enlarged or inverted with amazing speed and smoothness. Sprites can even stretch across several screens so scrolling landscapes are easy to achieve. Sinclair's own sound and graphics commands such as CIRCLE, DRAW and BEEP are fully supported.
MULTI-TASKING Without doubt White Lightning's most innovative feature is its use of interrupts to effectively run two programs at once. This means that while one program smoothly scrolls a landscape in the background, a second can animate the characters.
SPRITE DESIGN White Lightning comes complete with a separate 20k program for developing sprites used in the main system. Not only can you use this to design your own sprites from scratch, it also comes complete with 168 pre-defined characters covering games like Asteroids, Pac-Man, Assault Course, Defender, Space Invaders, City Bomber, Lunar Lander, Frogger, Centipede, Donkey Kong and many, many more. These characters are ready to use or can be enhanced. And sprites can be saved to tape between editing sessions before being finally loaded into the main program.
Machine Lightning is an advanced games writing utility which includes a full Macro Assembler, a Monitor/Disassembler, a Sprite Generator Program and the object code for the White Lightning graphics routines which have almost 100 documented entry points in 3k of code. The comprehensive manual explains how to use two copies of the object code to run machine code routines concurrently using the Z80 interrupts. Games written using Machine Lightning can be marketed with no restrictions.
THE MACRO ASSEMBLER This is arguably the most comprehensive assembler yet available for the Spectrum 48k. It supports Macros, conditional assembly and a full screen editor, and occupies 16k of memory.
THE MONITOR/DISASSEMBLER As well as all the usual monitor features, Spectre-Mac allows up to 10 breakpoints in ROM or RAM, has front panel display and single stepping.
THE SPRITE GENERATOR This is the same Sprite Designer/Editor supplied with White Lightning and can be used to design up to 255 sprites, up to a maximum of 12k.
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Name
Address
Telephone

Project X

PROJECT X casts you as a scientist doing experiments in miniaturisation. As you work there is a blinding flash and a burst of powerful radiation. You already know what effect that dose of rays will have and you rush to the car hoping that you can reach you friend's house a few miles away. As a fellow researcher he should be able to save you. The car crashes.

When you wake you have shrunk and the journey becomes a test of endurance, full of threats to your survival. Small creatures have become vast predators and haystacks intricate warrens of passage ways. A button becomes a shield, a needle a sword.

The game is a Quilled text adventure — it looks as if there is no credit for Gilsoft but play for a little while and they get their mention. It is a friendly game with some useful abbreviations over and above the usual Quill set and small graphic characters for objects. The programmers have taken care over their presentation and not slavishly followed the utility's layout.

Project X is a real change from goblin-bashing scenarios, showing originality in its plot and care in its design. It may not be one of the all time greats but you'll find it aggravatingly entertaining. Available by mail order from Compass Software, 63 Cozens Road, Norwich. *Richard Price*

PROJECT X
Compass Software
Memory: **48K**
Price: **£3.25 inc. p&p**
Gilbert Factor: **7**

Faerie
Ice Station Zero

BY ANYONE'S reckoning £1.75 is a good price to pay for a text adventure provided there has been no skimping on quality. 8th Day Software have introduced a suite of six games at that price, all written with the Quill.

The programs are graded from beginners standard to advanced difficulty and cover a range of subjects from science fiction to thrillers. It would have been useful to be able to look at the full set but regrettably only two of the games would load and only then after persistent attempts.

The two that loaded are quite adequate adventures. **Faerie** is set in a magical world of demons, eccentric wizards and changeling children. The game is of the advanced type and progress can only be made after a solid bout of clear lateral thinking. Both the setting and the puzzles are imaginative and intricate and you can expect long hours of perplexed entertainment from it.

Ice Station Zero, a beginner's adventure, is loosely based on the plot of a film with a similar title. A mad terrorist has taken over a polar research station and you must cross the lethal ice-pack to reach the installation before the maniac destroys New York. It may well be for beginners but it certainly is not a doddle by any means.

Richard Price

FAERIE
8th Day
Memory: **48K**
Price: **£1.75**
Gilbert Factor: **6**

ICE STATION ZERO
8th Day
Memory: **48K**
Price: **£1.75**
Gilbert Factor: **5**

ATRAM

EMULATE the exploits of Prince Andrew and cause havoc with a Harrier in **ATRAM**, a computer-moderated board game. The name stands for Advanced Tactical Reconnaissance and Attack Mission, which should ring warning bells from here to Port Stanley that we are in the realm of heavy wargaming, in spite of the homely lumberjack-shirted dad and his beaming son on the box-cover.

A wizard wheeze of diplomacy pits an RAF force of harriers against the US Air Force, also equipped with Wonderjet, so nobody has to play the Argentinians. The board shows a highly stylized coastline, and although cardboard-like has a steel core which allows the use of flat magnetic pieces representing aircraft, landing strips and even a mid-air refuelling tanker.

The object is to take out a number of the opponent's installations, by manoeuvring bombers and fighters across the ubiquitous hexagons. The computer's only role is to keep track of the status of individual aircraft — fuel, missiles, and so on — so two players are required, and the rules suggest ways of incorporating more with a hierarchy of command. The whole thing is clearly designed to feel like a NATO exercise, with four-star generals pushing pieces round a board.

If however, you can understand the rules and even enjoy several pages of over-enthusiastic technical praise of the Harrier and other weapons of destruction included in the game, you may enjoy **ATRAM**.

As such, it would make an ideal birthday present for your favourite prime minister or American president. Just think of the fun they could have, blowing each other to oblivion over the hotline.

Chris Bourne

ATRAM
PD Visual Marketing
Memory: **48K**
Price: **£19.95**
Gilbert Factor: **5**

Giant's Revenge

ONCE upon a time there was a game called **Jack and the Beanstalk**, which for some unaccountable reason got into the Top Ten charts.



Flushed with the sudden irrational tolerance of an otherwise critical market. Thor has released the inevitable follow-up. **Giant's Revenge**, in which Jack the yellow blob descends into the earth for more treasure.

One mistake on his narrow route and Jack's a dead blob. That is perhaps the most annoying aspect of the game. Not only must you discover how to collect the object at the end of each screen but you must also discover the correct route, pixel by pixel, regardless of where obstacles are placed. Sometimes you can walk straight through stalagmites or monsters. Sometimes they zap you before you even touch them.

Chris Bourne

GIANT'S REVENGE
Thor
Memory: **48K**
Price: **£6.95**
Joystick: **Kempston**
Gilbert Factor: **3**

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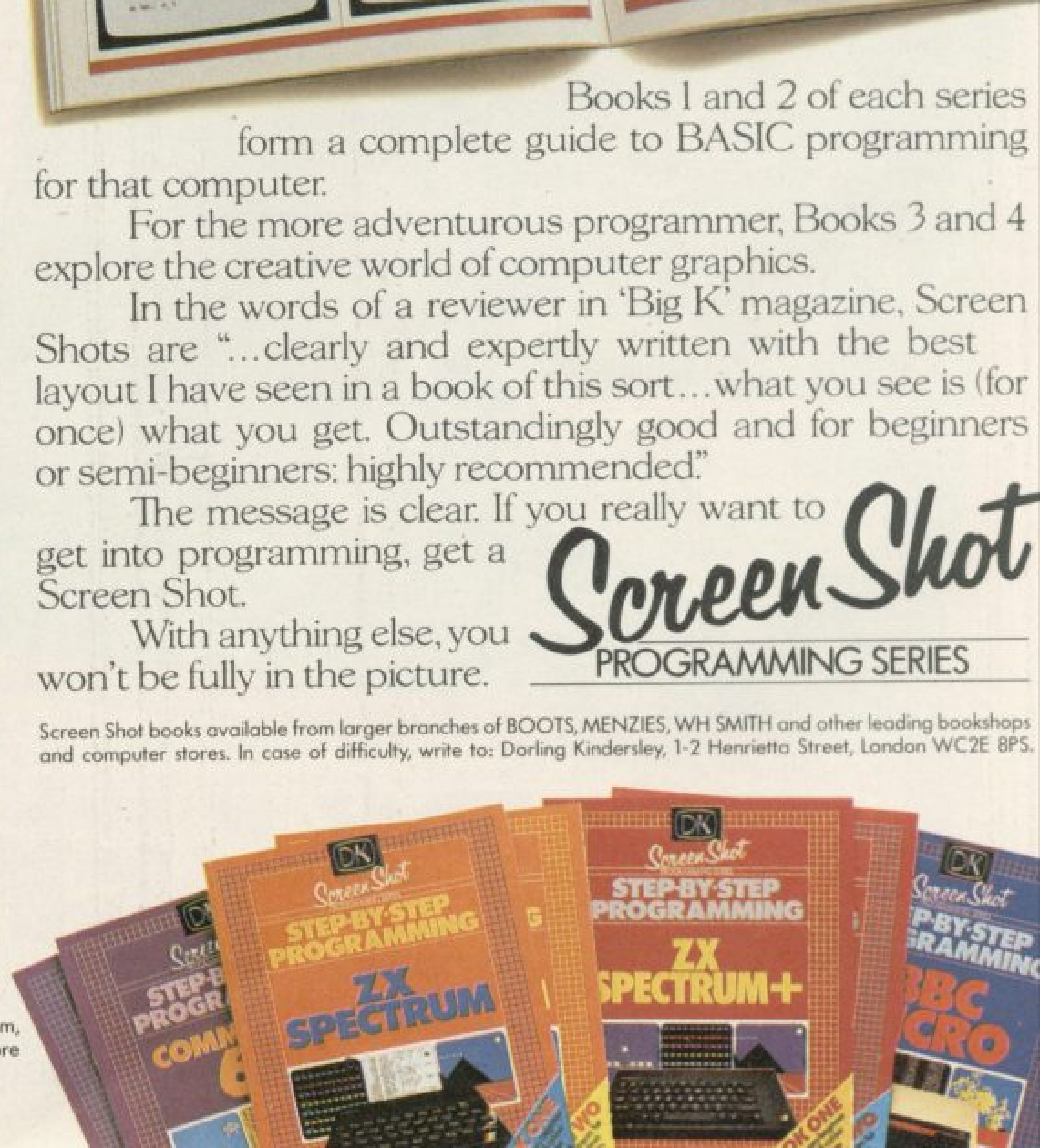
In the words of a reviewer in 'Big K' magazine, Screen Shots are "...clearly and expertly written with the best layout I have seen in a book of this sort...what you see is (for once) what you get. Outstandingly good and for beginners or semi-beginners: highly recommended."

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ZKUL

LO! From the depths of stygian orc-burrows, from the very fundament of the Gorbals, arises **Zkul,** the first commercial QL adventure. Glasgow-based Talent Computer Systems has opted for a classic text adventure, set firmly in fantasyland, replete with magic words, caves and passages, jewelled treasures, a lamp that always goes out at the wrong moment and various annoying dwarfs who appear and disappear at intervals by mysterious magical means.

As one might expect with a QL adventure, the game is vast, occupying 85K RAM and containing over 300 locations, a vocabulary of similar size and plenty of logic problems, many of which are not difficult to solve.

You and your 'friend' Eldomir are involved in the usual sordid expedition picking over the cultural heirlooms of a once-mighty civilisation fallen on hard times. Needless to say, you do the adventuring while Eldomir stays behind in a little hut keeping a beady eye on the loot.

The instructions supplied with the game are detailed and include a comprehensive guide to adventuring with advice on how to find the correct words, how to negotiate mazes, and so on. Armed with all those tips and advice, even the complete novice should have no trouble.

One unusal feature of the game is the use of hints at certain stages. Instead of responding to your pleas for help, the program recongises when you appear to be in difficulty and offers to sell you a hint for points knocked off your score.

The program can scarcely be described as original as an adventure, but is clearly aware of the fact, deliberately including variations on events in the original **Colossal Caves** adventure by Crowther and Woods and, one point at least, directly referring to it. Viewed as an act of homage **Zkul** does no disservice to the original.

It is a pity that something more inventive could not have been done with the QL to show off the chip architecture and operating system. The multi-tasking environment ought to make it possible to create real-time graphic adventures of great originality, and no doubt sooner or later something along those lines will emerge. However, such innovations require a huge investment of time and programming skill, and until the industry decides the QL market is large enough to support such investment, we shall have to make do with ideas developed from existing games.

Certainly Talent deserves praise for breaking the ice with **Zkul,** a humourous and affectionate romp through the bygone caverns of adventuring, when Polo mints grew on walls, the magic word was PLUGH and nobody knew how to get out of the goblin's dungeon.

Chris Bourne

ZKUL
Talent Computer Systems
Format: **Microdirve**
Price: **£19.95**
Gilbert Factor: **7**

Pascal

THE PASCAL package, from Computer One, produces code using an intermediate symbol language which does not bear much resemblance to 68000 machine language and will only run when the Pascal operating system has been loaded into the machine.

You may regard that as a little quibble but, when companies such as Metacomco are producing true machine code compilers at a cost which is little more than the Computer One package, some users — particularly in the hobbiest and serious ends of the market — are likely to be put off. The use of intermediate code also means that Pascal will run more slowly than if files were compiled into true machine code.

Despite the intermediate code Computer One has produced a powerful package the implementation of which is close to the ISO standard of Pascal. Added to the basic command specification is an instruction subset which implements the graphics features normally obtainable through the SuperBasic interpreter. All forms of graphics can be drawn including circles, curves, lines and points. Remember, however, that the language was not written for the arcade game writer.

The construction of a source program followed by editing — if necessary — and compilation is a simple process conducted from a main menu. A cursor is positioned against the task which you want the operating system to perform and the ENTER key is pressed. If you want to edit a source file, for instance, you would select the appropriate option and the Editor would be loaded from microdrive. A full screen editor, similar to the one available in Metacomco packages is available, although it is not easy to change the size of the listing window as it is with Metacomco **Assembler, BCPL** and **Lisp.**

When going through the procedure of creating a program filename a suffix is added automatically to each types of file as it is saved. That tells the operating system whether a file contains source code, intermediate code for editing, or final copy compiled code. The three-character suffix is also useful for users' reference although errors and confusion can occur if you try to load the incorrect file. You can also forget the file name extensions as they are not very memorable and you will find that constant reference to the User Guide, supplied with the package, is a necessity.

The well-written guide is supplemented by example programs on microdrive. Those include a mathematics routine which shows the numeric power of the package and the QL, a graphics display, and a simple version of the ancient puzzle Towers of Hanoi, which looks as if it could have been written for a ZX-81.

All the example programs have to be compiled from the source listings on microdrive before they can be run.

The decision as to whether to buy **Computer One Pascal** will depend on whether you want an intermediate or independent code compiler. The former will suffice for beginners who will find the Computer One package a delight to use. Those who are not new to Pascal, however, might want to wait for the package planned by Sinclair Research before committing themselves to one or the other.

John Gilbert

COMPUTER ONE PASCAL
Format: **Microdrive**
Price: **£39.95**
Gilbert Factor: 7


brother
DRAG

Find a mystery word and win a Brother printer

Everybody wants a printer, but not everybody can afford one. Now is your chance to win one of three superb printers from typewriter specialists Brother.

First prize is the new M1009 printer with a dual Centronics/RS232C interface. It uses a 9-pin dot matrix print head, giving the full ASCII character set, with additional graphics, plus the IBM character set. Printing at 50 characters per second, a choice of styles gives you 40, 80 or 132 columns across a maximum 10ins of paper.

Second prize is the HR-5 dot matrix printer, with ASCII, 63 block graphics, and international symbols. It prints at 30 cps and, like the EP22, can be used with batteries or off the mains. You can choose between versions with Centronics or RS232C interfaces, and use either a thermal ribbon or thermal paper.

Third prize is the very popular Brother EP22 typewriter/printer. The EP22 is a powerful electronic typewriter in its own right, with a 2K text memory, facilities to correct text before it is printed, and the ability to operate as a calculator. It includes an RS232 interface, allowing you to connect it to your computer and use it as a dot matrix printer complete with a 32-character print buffer.

The M1009 retails for £199, the HR-5 for about £159, and the EP22 for £109.95, so there is nearly £470 worth of prizes up for grabs. All you have to do is find the mystery word by following the instructions.

Answer all the questions below and write the answers in the boxes. The letters which fall into the numbered boxes will, when sorted into the correct order, spell out the name of something you want.

Write the mystery word on a postcard together with your name, address and telephone number and send it to: *Sinclair User*, EMAP Business and Computer Publications, Priory Court, 30-32 Farringdon Lane, London EC1. All entries must be received by Friday, February 22nd. The first correct entries out of the hat after that date will decide the winner. Employees of EMAP and Brother, their relatives and associates are not eligible for entry.



M1009



HR-5



EP22

1 He invented the printing press (boxes numbered 9, 14)

2 Typeface with sloping letters (boxes numbered 5, 8)

3 Floral typewriter/printer (boxes numbered 1, 12, 15)

4 Printer which uses heat to write on the paper (boxes numbered 6, 11, 4)

5 Special area of RAM which stores characters to be printed (boxes numbered 10, 3, 7)

6 One of two standard printer interfaces (boxes numbered 13, 16, 2)

Graphically illustrated

IF YOU have spent many hours trying to draw pictures on the Spectrum the Grafpad from British Micro is a godsend. It is possibly the easiest way to design a masterpiece and something the dedicated artist should not be without. The only major drawback is the price, £125 plus VAT.

A graphics pad, or digitising tablet as they are sometimes called, is simply a pad which represents the TV screen. A pen, electrical not ink, is used to draw on its surface and that is reproduced on screen.

It connects to the Spectrum user port by way of a 18cm flexible cable, which excludes the use of any other add-ons other than those with a through port, such as Interface 1. The cable connects to the right hand side of the pad and so it can only be sited to the right of the computer. That is a problem for left-handed people or those with a full size keyboard where the Spectrum PCB tends to be on the left. The cable can not be extended without causing the system to lock.

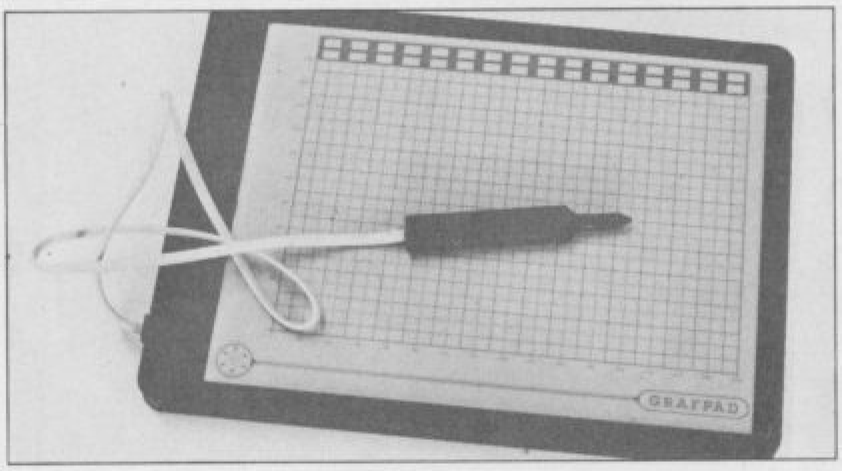
The pen also plugs into the right hand side, using one of the increasingly popular telephone style jacks, and the software to run the system is supplied on cassette.

To help you draw you can set a window which will limit the area of screen on which you can work, ensuring you do not disturb the rest of the drawing.

Areas of the screen can be magnified for clarity and then reduced and there are two overlay grids, one which simply strips all the colour to show ink and paper and the other which highlights the character squares using Bright.

Once the picture is on screen the whole thing can be inverted, ink to paper, or flipped, left to right and up and down. It can be scrolled in four directions and will wrap around.

If you can afford it then contact British Micro, Penfold Works, Imperial Way, Watford, Hertfordshire.



Spectrum is slowed down

HAVE YOU ever wished that there was some way to slow a game so you could get past the first screen without getting zapped? If so your wish has been granted by Cambridge Computing with its new Slomo device.

On the front of it are two push buttons, a rotary speed control and an LED.

One of the buttons is used to stop the Spectrum and the other activates the speed control.

Slomo lends itself to a number of uses. For the games player it allows that extra edge while the machine code addict can use it to see, if it is on screen, the code working step by step. Listings can be slowed and anything normally too fast can be set to a manageable speed.

An ingenious device and reasonably priced at £14.95, from Cambridge Computing, 61 Ditton Walk, Cambridge CB5 8QD.

Digital design dexterity

TWO YEARS ago RD Laboratories launched the RD Digital Tracer for the Spectrum. RD has now brought out a new version which can work on areas up to A3 in size.

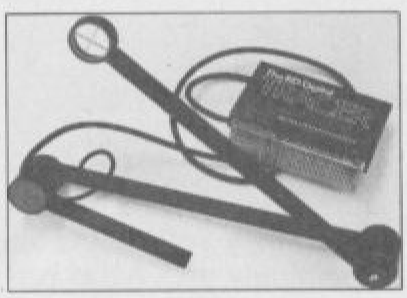
As well as reproducing lines you can draw shapes, fill areas, change colours and insert text. You can store a sequence of movements and then replay it.

Microdrive users are catered for with a program which can be merged into the main program.

The tracer connects to the Spectrum user port by way of a ZX-81 size connector. It has a through connector for other add-ons but, other than the ZX Printer, there are few which do not require all the lines. The new version does not differ greatly from the old. It is accurate and moderately easy to use but it is extremely slow.

At a price of £75.50, including VAT, the Tracer could be better. It may have been marvellous two years ago but the add-on buyer is older and wiser now.

The Tracer is sold by Kane-May Ltd, Welwyn Garden City, Hertfordshire AL7 4BR.



The dead will not lie down

FULLER is dead, long live Fuller. From the ashes of Fuller's demise Nordic Keyboards UK has risen like a phoenix to carry on the name.

Nordic Keyboards, who used to make the keyboards for Fuller, stepped in, bought up the old stock, and is now selling all the old products, including a brand new keyboard.

The Executive keyboard is outwardly very similar to the Fuller FDS, but inside it has been completely changed. You no longer have to remove the Spectrum from its case.

Interface 1 users are also catered for and with a little minor surgery to the back of the case it too can be fitted inside.

The keyboard gives you nine extra function keys, as well as doubling up the shift keys. These are four shifted cursor keys, E mode, Delete, Full Stop, Comma and shifted Break. The only other key which might have been useful would have been Edit but the two oversize Caps Shift keys almost make up for it.

As with the original Fuller keyboards it rattles a little in operation but the keys have a good, if light, feel to them. The shifted cursor keys are a boon when programing or word processing.

The price of £59.95 puts it in the middle of the keyboard price range among many which do not have moving keys, which require you to disassemble the Spectrum and which do not have as many functions.

Further details of Fuller products including a revamped FDS, can be obtained from Nordic Keyboards UK, Randles Road, Knowsley, Merseyside. Tel: 051-546-0486.

more hardware on page 48

Rough but reasonable

MANCOMP is the latest company to enter the highly competitive add-on keyboard market for the Spectrum. Its MO184 keyboard is attractively styled but unfortunately its looks are deceptive.

The casing is large, and has a cut-out for the power supply and an indent at the top to hold a pen. The black top half is constructed from glass fibre; that makes cutting it or screwing the base to it difficult unless you have muscles like Arnold Schwarzenegger.

The green base, is made of an indeterminable material, rather brittle around the screw holes. To fit a Spectrum the top half of its case is removed and the bottom half fitted to the base. It is held by two plastic tabs at the front — barely adequate, especially if an Interface 1 is fitted. There is nothing between the Spectrum PCB and the keyboard PCB, a potentially dangerous state of affairs. When fitting Interface 1 a slot for the microdrive lead will have to be cut in the casing.

The keyboard has the usual forty keys, although the bottom row is not offset as in the standard QWERTY layout, plus extra ones. On the right is a numeric pad with an extra Enter and single function Full Stop. The main pad has two extra Caps Shifts, in yellow, and one extra Symbol Shift, in red. There is also a Break key and four cursor keys, in green, placed either side of the full size space bar, which all require shifting. The legends are stuck on but are due to be replaced with directly printed ones.

You will either like the feel of the keys or not. The tops occasionally foul the switches, depending on where you press them.

Provided you are prepared to spend some time working on it the keyboard could be made reasonable, but it costs £54.95 and there are many others within the same price range with much more going for them. For further information contact Mancomp Ltd, FREEPOST, Manchester M19 3BR. Tel: 061-224-1888.



Communicating down the line

THE PROTEK 1200 modem and Spectrum interface are now available and can operate in two modes, 1200/75 for database connection such as Prestel and Micronet 800 and 1200/1200 for user-to-user communication over the telephone lines.

In Prestel mode the Spectrum becomes a Prestel keypad and basic information on using it in that mode is given in the instructions.

In user-to-user mode the other party you are contacting must also have a Protek 1200 modem running under the same software. After setting up the telephone link, informing the system of where the file you want to send sits in memory and defining block start and size for the code you are ready to transfer data.

Priced at £59.95 for the modem and £24.95 for the Spectrum interface they are available from Protek Computing.

Adaption for monitor use

SERIOUS users of the Spectrum have long bemoaned the lack of a way to drive a monitor. Adapt Electronics has now brought out a RGB interface which should drive all standard monitors which can accept TTL input.

As usual, it connects to the Spectrum user port and is dead-ended. It connects to the monitor by a 6 pin DIN socket.

Compared to the normal TV output the picture is rock steady and very clear. The only drawback is that Bright will not work.

The interface, priced £29.95 plus £1 p&p, is available from Adapt Electronics, 20 Starling Close, Buckhurst Hill, Essex IG9 5TN.

Forget the memory blues

ONE of the problems with the Spectrum is that the Z80 CPU can only address 64K of memory. With 16K taken up with the ROM that only leaves 48K to play with.

The XK upgrade from Television Services of Cambridge goes a long way to solving the problem. Available as a kit, or fitted by the factory, it allows you to page the upper 32K of memory and, when fitted to a standard 48K Spectrum, gives you access to the unused side of the internal memory. The amount of extra memory gained in this way will vary from perhaps a few bytes to, if you are lucky, the full 32K.

In addition up to 128 pages can be added externally. More than two or three will need an extra power supply, which makes a 4Mb Spectrum a reality. As the system only uses A1 to page the memory it will clash with any Sinclair hardware such as Interface One, and, with a few exceptions, be transparent to software.

Fitting the kit is not for the nervous as not only do you have to solder direct to the Spectrum PCB but you also have to cut a number of tracks. That will play hell with your warranty.

The system can be used on its own but it is supplied with a Basic extension that gives you windows and multi-tasking. Each page can be assigned a window, only limited by the number of pages, and each can have a program running in it at the same time. The lower 16K can be used to pass information from one page to another.

The way the commands are used will depend on whether you have Interface 1 fitted. If so they take the form of, for example, *page n or *multi. which swops pages or calls the multitasking. Without Interface 1 RAND USR statements have to be used.

Although, the system should not be affected by commercial software some, notably the Ultimate programs **SabreWulf** and **Atic Atac**, cause it to crash. A loader program will soon be made available to overcome that.

For £15.95 for the kit, or £20.95 fitted, both inclusive of VAT and p&p, the system has a lot to offer. Provided more software is made available it could tempt users away from spending £400 on a QL. For more information contact Television Services of Cambridge Ltd., Chesterton Mill, French's Road, Cambridge CB4 3NP. Tel: 0223-311371.



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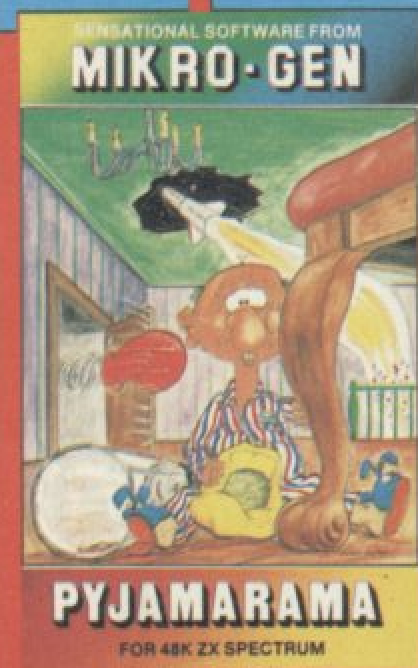
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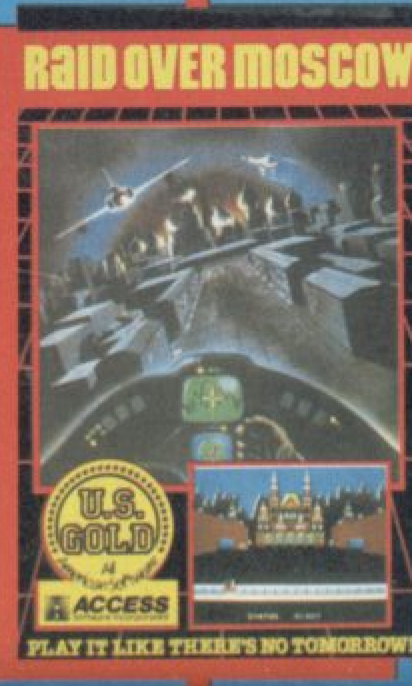
Daily Mirror / Sinclair User

Software Top 30

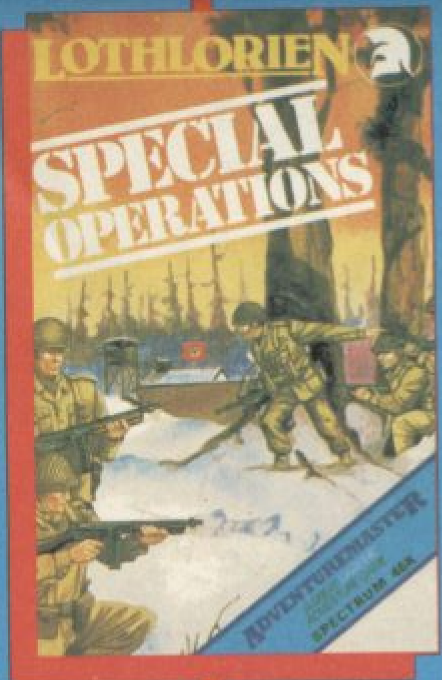




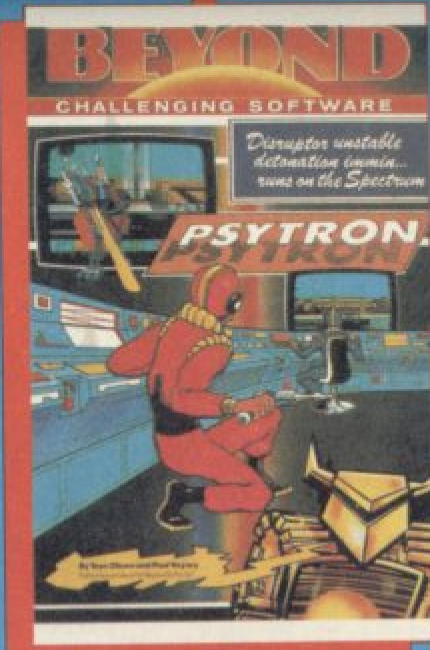




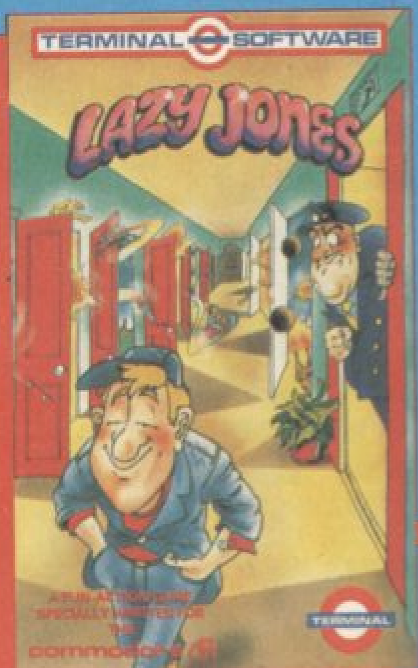
THIS WEEK	LAST WEEK	WEEKS IN CHART	TITLE	Publisher	Computer	SPECTRUM	VIC 20	CMMDRE 64	ELECTRON	ATARI	DRAGON	ORIC	BBC	OTHER
						(Also Available on)								
1	2	2	GHOSTBUSTERS	ACTIVISION	COMMODORE 64			●						
2	1	8	DALEY THOMPSON'S DECATHLON	OCEAN	SPECTRUM	●		●						
3	–	1	STARSTRIKE	REAL TIME	SPECTRUM	●								
4	–	1	ELITE	ACORNSOFT	ELECTRON				●				●	
5	–	1	RAID OVER MOSCOW	U.S. GOLD/ACCESS	COMMODORE 64			●						
6	–	1	PYJAMARAMA	MICRO GEN	SPECTRUM	●								
7	4	6	ELITE	ACORNSOFT	BBC				●				●	
8	–	1	MATCH PLAY	OCEAN	SPECTRUM	●								



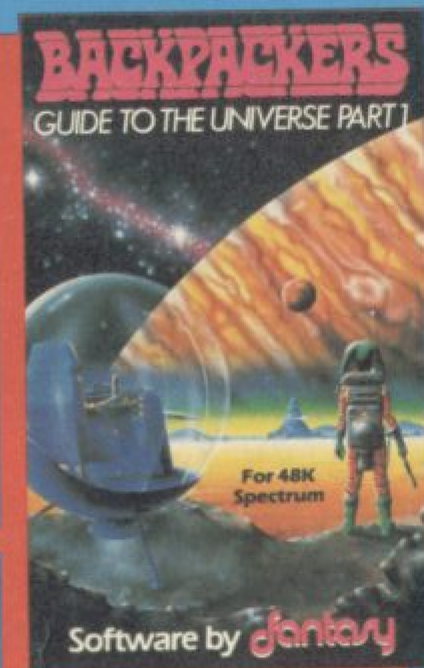
9		1	BOOTY FIREBIRD	SPECTRUM									
10	14	2	SKOOL DAZE MICRO SPHERE	SPECTRUM	•		•						
11	5	9	DALEY THOMPSON'S DECATHLON OCEAN	COMMODORE 64	•		•						
12	–	1	HUNCHBACK II OCEAN	SPECTRUM	•								
13	9	6	CHILLER MASTERTRONIC	COMMODORE 64			•						
14	3	3	KNIGHT LORE ULTIMATE	SPECTRUM	•								
15	11	3	SELECT ONE COMPUTER RECORDS	COMMODORE 64	•		•						
16	8	14	BEACHHEAD U.S. GOLD/ACCESS	COMMODORE 64	•		•						
17	–	1	COMBAT LYNX NEW GENERATION	COMMODORE 64	•		•						
18	17	2	SELECT ONE COMPUTER RECORDS	SPECTRUM	•		•						
19	–	1	AIR WOLF ELITE	SPECTRUM	•								
20	15	6	BEACH HEAD U.S. GOLD/ACCESS	SPECTRUM	•		•						
21	–	1	PERILS OF WILLY SOFTWARE PROJECTS	VIC 20		•							
22	10	2	CYCLONE VORTEX	SPECTRUM	•								
23	20	4	BMX RACERS MASTERTRONIC	SPECTRUM	•		•						
24	–	1	SCRAMBLE 64 INTERCEPTOR	COMMODORE 64			•						
25	–	1	BOOTY FIREBIRD	COMMODORE 64	•		•						
26	28	2	DOOM'S DARK REVENGE BEYOND	SPECTRUM	•								
27	–	1	JET SET WILLY SOFTWARE PROJECTS	COMMODORE 64	•		•						
28	12	3	UNDERWURLDE ULTIMATE	SPECTRUM	•								
29	23	4	COMBAT LYNX DURRELL	SPECTRUM	•								
30	26	2	JET SET WILLY SOFTWARE PROJECTS	SPECTRUM	•		•						

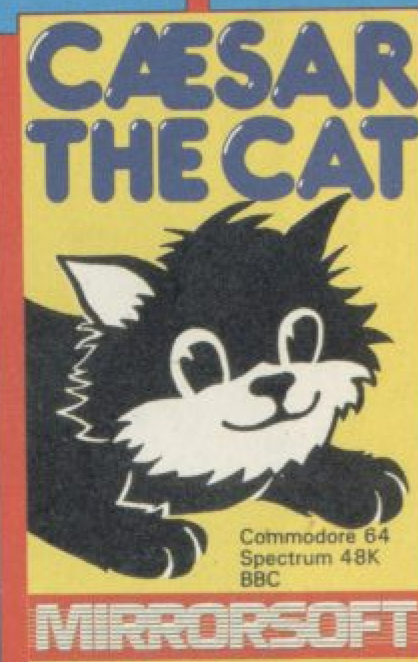


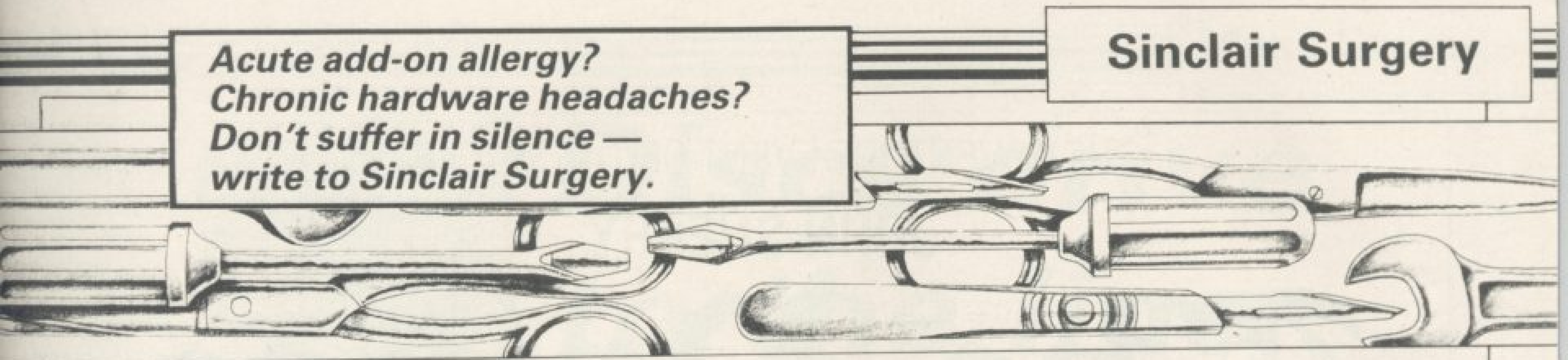




Look out for the brand new Top Ten in the Saturday edition of the Daily Mirror every fortnight and Sinclair User every month. The information for the Top 30 is compiled by N.O.P. Market Research and founded by Computer & Video Games magazine in sponsorship with the Daily Mirror.







The byting problem

I HAVE been having problems with commercial cassettes. On three out of the six I have purchased, all that comes up on the screen is 'Bytes C' or 'Bytes Fruitcake' etc: I have returned those cassettes to the companies I purchased them from, asking what could be causing the problem.

Unfortunately some companies haven't replied.

Brett Clenn, Bundaberg, Australia

• *To load commercial games the sequence of keys to be pressed is Load followed by two quotes — hold down the Symbol Shift, press P twice, and then Enter. Some, such as* **Halls of the Things** *which gives you the 'Bytes: Fruitcake' message, require the keyword Code to be used as well. Before pressing Enter hold down Symbol Shift, press Caps Shift so the cursor changes to a flashing E, then release the shift keys and press Code — on the I key. Now press Enter and the game will load.*

Vanishing cursors

AFTER ten months of trouble-free use with my 48K Spectrum, two problems, which may be interrelated, have suddenly occurred.

When I get to the 40th file of OCP's **Address Manager** the cursor disappears, which means that the program and file tape have to be reloaded.

Again, with Psion's **Scrabble,** I can load only a quarter of the program. It seems to me that the computer is acting as if there is no memory left.

It is fitted with a Saga keyboard, by the way.

Mark Couter, Anglesy, Gwynedd.

• *Adding a full size keyboard should not affect the computer's memory. As the Spectrum is less than a year old then you could send it back to Sinclair Research, in the original keyboard, for repair. Sinclair tends to take a long time to fix machines and so you may be better off sending it to one of the repair companies that advertise in* Sinclair User.

Stationary scrolling

WHEN I have loaded a program into my ZX-81, I get the result '0/0'. By then pressing Newline without a list command, the screen will seem to scroll on a line and not move it up.

Colin Martin, Wolverhampton.

• *That is a standard feature of the ZX-81 and there is nothing you can do to stop it.*

Bugged by dot crawl

I HAVE a six-month-old 48K Spectrum and a new Ferguson TX Portable 14" colour TV. The TV display suffers from dot crawl.

P T Duggan, Romford, Essex.

•*Depending on which issue Spectrum you have it is possible to tune it to the TV. Issue One has a small hole in the bottom of the case which gives access to a variable capacitor VC1. On Issue Two the case has to be opened and VC1 is the one nearest the back.*

VC1 controls the clock frequency and adjusting it can sometimes eliminate the vertical shimmering lines on the screen. There are also two variable resistors; VR1 is to the back, and controls the red-yellow amptitude and VR2 the blue-yellow. Those controls were discontinued from Issue Three onwards.

Chatting to your chips

EVERY now and then while I am in the middle of a program the computer crashes and I have to pull the power lead out. Is there a cure?

Also, what is the best speech and sound unit available?

Daniel Marks, Prestwich, Manchester.

•*All the Speech units for the Spectrum and ZX-81 use the same speech chip. The Cheetah gives you speech while the Currah will amplify it through the TV. The Fuller Box, has a joystick port and sound chip and William Stuart offers a range including both speech input and output.*

Computer crashes can depend on many things. If you have something plugged in the back then make sure it cannot wobble and the edge connector is clean.

The issue in question

I AM the owner of a Spectrum 48K — by the way, how can I find out whether it's a 1, 2 or 3 — with an Interface 1 and microdrives. Last week I bought a Gemini-10X printer — in replacement of my Seikosha GP-50S — and had to buy another interface, Sinclair Centronics/RS232, with a Centronics cable.

I had hoped that I could connect both printers at the same time and run both my old and adjusted programs. However, this doesn't seem to work.

Jelle A R Meiburg, Marbella, Spain.

•*You can find out which issue Spectrum you have by entering, as a direct command, PRINT IN 65278. If the answer is 255 you have an Issue One or Two, if it is 191 it's Issue Three or other.*

Most full size printer interfaces work by redirecting output meant for the ZX Printer — LPRINT and LLIST — to the interface. The GP-50S is a direct replacement for the ZX Printer and so it is no longer receiving any information. To remedy use OPEN #3, "p" to direct output to the Seikosha and RAND USR 64973 to redirect it to the interface.

Taping the conversion

IS THERE a conversion tape to change the ZX-81 so that it is able to take Spectrum games tapes?

Paul Byford, Dunmow, Essex.

•*The only thing which comes close is one by Ness Micro Systems, 100 Drakies Avenue, Inverness IV2 3SD, which converts ZX-81 Basic programs to run on the Spectrum.*

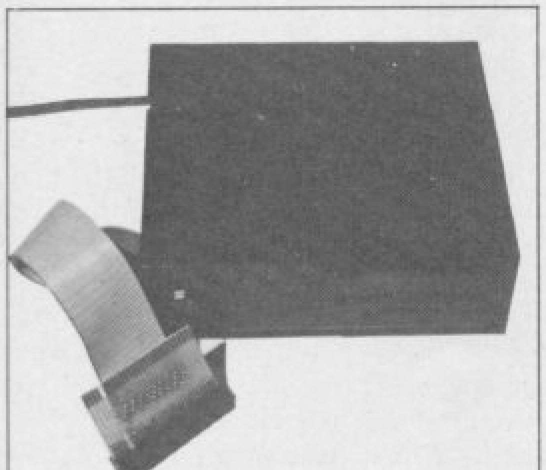
DIY surgery at home

I OWN a ZX Spectrum which has become faulty. As I would like to carry out the repairs myself, could you advise me where I might obtain a circuit diagram?

R McWilliams, Seascale, Cumbria.

• *CPC, 194-200 North Road, Preston, Lancashire (Tel: 0772-555034) can supply one for £15.00.*





Discs drive to the line

The last of our fast storage series takes the finalists in our disc systems race to their limits

IN THE MOVE to smaller and smaller computer systems designers face a problem with disc drives. The 5¼in disc has become the accepted standard and to change it means everyone has to agree on a new one.

As readers will realise, trying to get the computer industry to agree on anything is well nigh impossible. Two designs were originally presented, 3in and 3½in discs. The business sector is slowly accepting the 3½in system and now the 3in is proving popular in the home industry with systems available for the BBC, Amstrad and now the Spectrum.

This month, in the final part of our look at fast storage systems, the Statacom and Thurnall interface/drive systems are put under the spotlight. Statacom supplies an interface which can be purchased separately from the drive and which can run all three sizes of drive, but it is also sold as a package with the 3in Hitachi drive. The Thurnall system is only sold with a drive. Until recently that was the infamous Hungarian MCD drive but from January it is supplied with a 3in Hitachi.

The 3in disc, unlike the 5¼, is housed in a solid plastic casing. The disc surface is protected by a metal shutter which moves out of the way automatically as the disc is inserted. The discs are double-sided, the second side used by taking the disc out of the drive, turning it round, and inserting it the other way up.

Those features make the discs easy to use and carry but also increase the cost. The average price for a 3in disc is around £5.00 while a 5¼ would cost only £2.50. Also most drives, including the Hitachi, can only give 40 tracks which decreases the amount of information they can hold. That was one of the prime reasons why they did not find favour in business.

Regular readers of *Sinclair User* will remember one of the first disc systems for the Spectrum, that from Interactive Instruments — later taken over by Primordial Peripherals. Those that do will immediately feel at home with the Statacom interface. The two are almost identical, even to having the same error codes, except that the Statacom system, for some inexplicable reason, only allows five characters for file names as opposed to the original six.

On power up, or when a reset button on the interface is pressed, the operating system is loaded into memory. That occupies roughly the top 8K and a number of variables are initialised, taking a further 111 bytes; those can be cleared and the functions called directly. To use the system f$ is set to the file name and then, for Basic, RAND USR bs entered to save and RAND USR bl to load. Code and data are handled in the same way, using cs, cl, as and al. Basic programs cannot be merged.

By adding a number of parameters to f$, for instance LET f$="code,32000,200,32000", the start and length of the code can be specified — the last figure is optional and is the auto-run address. Basic can have a line number added in the same way. Data is handled differently as only dimensioned arrays can be saved; one of the tracks has to be specified as to where the data is saved.

Each track can hold up to 2816 bytes of data, and 39 tracks can be used, the remainder used for the directory. That gives a total of 107.25K of storage per side but it would be very difficult to use all of it. Up to 39 files can be stored, each using one track, but for maximum use they would each have to fill the track. The maximum length code file which can be saved is 11 tracks, 30.25K, and arrays cannot occupy more than one track; for example a single dimension string array cannot be greater than 2808, to allow for system identifiers.

The commands to CAT, format, backup or erase are called using dir, nd, back and zap respectively, the last requiring the file type to be added to f$. The system can, in some cases, be re-initialised by a call to the DOS.

The speed of disc compared to tape is fast but would not win any prizes in the disc Grand Prix. Using the simple test used last month it takes three times as long as the Thurnall system to load — one minute and 23 seconds compared with 37 seconds — and one minute and 42 seconds compared with 59 seconds to save. Erasing also takes longer at 51 seconds compared to 43 seconds. Only format is faster, 29 seconds as apposed to 35.

The disc supplied with the system contains a utility program and 15 Basic games. All of those are called from a menu program and should, in theory, return to it when the game is played. None of the games are particularly exciting — better programs appear in the listings section of *Sinclair User* — and not all return to the menu. Only a **Fruit Machine** program is memorable in that it proves impossible to lose money on it.

The interface fits directly onto the back of the Spectrum and has a through port for add-ons; the drive connects via a cable at the back. As mentioned there is a reset button on the top, and there is also a mysterious set of DIP switches to which no

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reference can be found. No reference can be found either regarding a second drive and so it would appear that only one can ever be used with it.

The Thurnall system uses a very different approach. This time the interface and drive are housed in the same box and the connection to the Spectrum, at the end of a cable, has a through port. The box also has a reset button which will reboot the system, but it can also be used to load a Basic program.

When the system is booted a line of Basic, taking 56 bytes, is entered as line 0. That can be removed, so that no memory is used, by a simple poke. With the line all the normal Spectrum tape commands can be used with the



addition of AND FN d() tacked on the end — that can be changed by the user to be any other function. Without it USR 5645 has to be added instead.

A CAT is performed using LIST, LLIST sends it to the printer, and CLEAR is used to format. Files are erased using the normal erase keyword and there is the option of using a wild-card. The minus sign can be used to represent any character so that 'test1', 'test2' and 'test3' can all be erased with the simple 'test-'. A useful feature is that if the file name is given as '--------' then all the files on the disc will be erased — much quicker than reformatting the disc.

One anomaly is that, unlike tape commands, a file saved using SCREEN$ must be loaded using it — you cannot use CODE — and you can load just part of a code file. Data is also handled differently. Only dimensioned arrays can be saved, undimensioned strings are dimensioned before saving and multidimensional arrays are changed to a single dimension. Also something saved as a numeric variable can be loaded back as a string variable. That would appear to be a design feature rather than something of great use.

Each side of the disc has 39 available tracks and each holds up to 4K, a total of 156K. When the directory is shown the file name for each track is shown and so may appear more than once — a little confusing. The file names can be up to seven characters and no differentiation is made between upper and lower case. In addition a Basic program, up to 2560 bytes long, can be saved with the file name USR and that is stored on the directory track. When the reset button is pressed that is loaded, and if saved using LINE will auto-run. This is the one program that will also auto-run if merged.

The interface is capable of driving up to two drives and also has a limited RS232 port, set at 1200 baud — limited in that it is monodirectional and so cannot tell if, for example, a printer is busy. It gets round that by having a delay from five to 12 seconds after every return character to allow for the line feed. A return is sent after 64 characters. As with Interface 1 with which it is compatible, listings can be sent with or without the tokens expanded.

If you want a system which will allow you to transfer your commercial programs to disc then you will find little software which will not work with the Thurnall system. The Statacom system, on the other hand, causes problems. Most programs store their code at the top of memory, in the same area used by the system. Some, as with **Masterfile**, also use f$, which make them doubly difficult, if not impossible to transfer.

The Statacom interface sells for £75.00, or with drive for £240, both plus VAT. The Thurnall system is £219.95 inclusive of VAT and p&p, and is available by mail order.

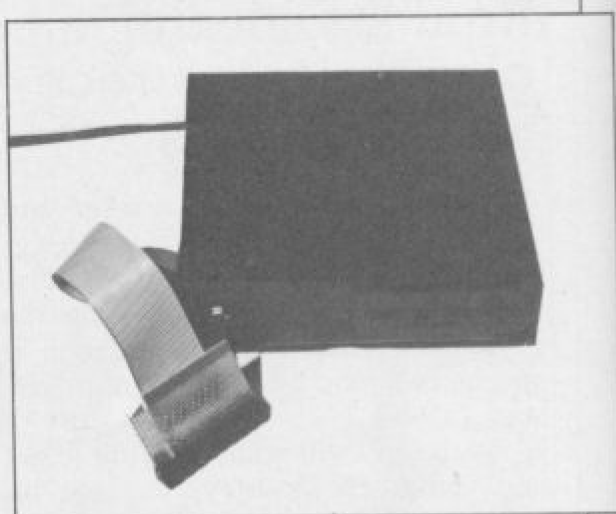
Before buying any system you should consider carefully what you intend to use the system for. Of the seven systems we have looked at in the series, and there are at least two more in development at the moment, each has its good and bad points.

The **Challenge Sprint** is cheap and allows most games to be loaded quickly, although it will not be able to handle the new Ultimate games with their non-standard loading speeds. The **Sinclair microdrive** is well known and has a few programs available for it. The **Wafadrive**, although slow, is reliable and good value with two drives, Centronics port and a word-pro program.

Systems which use disc drives have the advantage that when you change computer the drives will still be usable. They may be expensive to begin with but their reliability, low cost discs and disc capacity can soon offset that. If for example, you buy 50 discs, there is a saving of over £150 for the same number of microdrive cartridges.

Of the four disc systems **SPDOS** from Watford is probably the most technically advanced but uses a lot of memory, as does the **Statacom**. The other two, from **Technology Research** and **Thurnall**, both use very little memory and so are more versatile. With Technology Research there is also a choice of drive and random access.

It would be unfair for us to pick one system in favour of another as everyone will want a system for different reasons. Whatever you choose, and this may be a hackneyed phrase but never more true, it will add a new dimension to your computing. Things that are impossible with a cassette, or would simply take too long, are now within reach. A list of telephone numbers can be kept and loaded in seconds rather than minutes and any number of programs can be chained together



to give one long program. Imagine the sort of adventure program which could be written using an 80 track, double-sided drive.

The drawback to all this is that, at the moment, very few software houses are willing to make their software available on anything other than tape. Until they do it is an invitation to users who, having paid good money, break into programs and make copies.

Statacom Distribution, 18 Grove Road, Sutton, Surrey. Tel: 01-661-2266

Thurnall Electronics, FREEPOST, Cadihead, Manchester M30 6DX. Tel: 061-775 7922.

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(Carr. on Drives £7—Securicor)

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Epson RX80 F/T	£245.00
Epson FX80	£316.00
Brother HR15 Daisywheel	£339.00
Epson FX100	£435.00
KAGA/TAXAN KP910	£339.00
Centronics or RS232 Printer cable (Please specify which is required)	£8.00

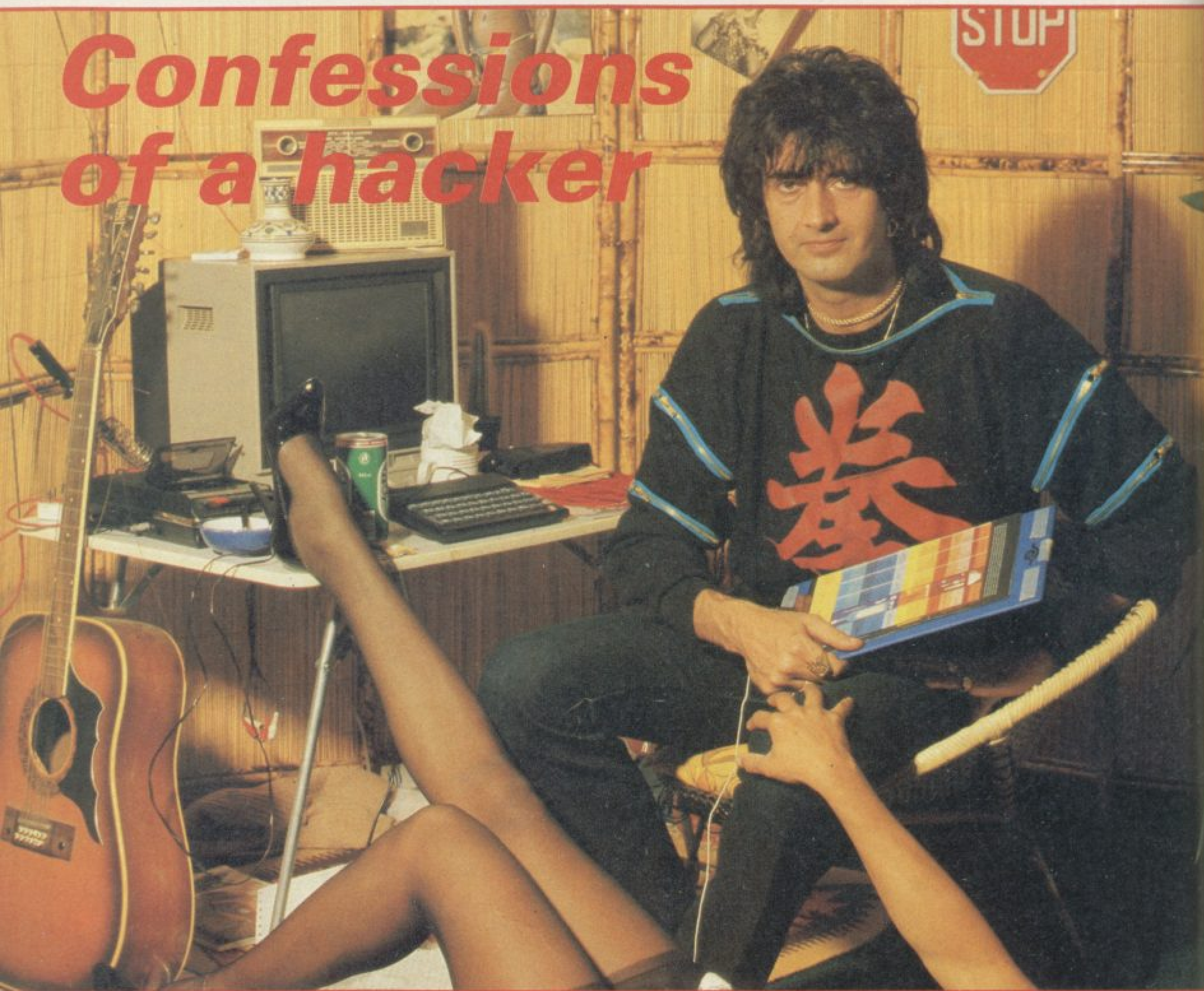
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Confessions of a hacker



Chris Bourne beats the system with the exotic Lee Kristofferson rock star and hacker supreme

THE STRIPPER was awful. Lee Kristofferson turned his jaundiced eye to the empty glass and arrived at a decision. He walked out of the Kingston pub and across the road to the Visions computer store. He was about to sell his first program.

While explaining his game to the people in the shop software publisher David Giles walked in. "That's who you should be talking to," they told Lee, so he did.

David Giles was taken aback at first. "When this guy came up to me with a line about being a rock star with flight simulation in 3.5K for the Vic 20 I thought it was a wind-up," he says. "Then I discovered it was genuine."

Rock star? What is a rock star doing writing computer games? To answer that we must backtrack, to the years of struggle and dog-food curries. "I was only ever interested in music," Lee says. Although he did well at school, he parted company with his parents' ambitions, left, and went to work at the fairground at Chessington Zoo.

"I gravitated downwards after that." Eventually he found the break he was looking for and began working in record production. On the way he took a course in Behavioural Psychotherapy. "I've got a diploma and things," he says. "It was great. Everyone sat around talking continuously about sex. I'm still very into biofeedback."

In 1977 he got a chance to record a single himself, rather than produce other people's records. "I found a song called *Dinner With Drac* which was a hit in 1959 for someone called John Zacherle. I thought any hit with a title like that deserved attention so I recorded it. I backed the single with one of my own things, *Night of the Werewolf*." The name Lee Kristofferson — real name John Wagstaff — came about as a reversal of Christopher Lee.

Lee is not particularly well-known in Britain, but is very successful on the continent. One of his problems is the way foreigners take his black sense of humour seriously.

"I'm really big in Egyptian discos. I did an Egyptian disco number called

Cleopatra. You write lines like 'The night won't be so scary, when you ride my dromedary' and people take it seriously."

The Swiss really get Lee going. "I was in Jordan, in the desert. Jordan is hot, real Lawrence of Arabia stuff. And this Swiss guy turns up; 140 degrees, and he's immaculate. I say 'Hot, isn't it?' — a typical British thing to say. So he opens his case. There's everything in it from blood-pressure meters to enemas. He pulls out a thermometer, holds it up, looks at it and says 'Ja'. The Swiss always take me very seriously."

Moving through such exotic delights as *Psychotic Reaction* — conceived in order to "liven up *Mull of Kintyre*, an otherwise wonderful song" and which reached number one in the *Sounds* alternative record chart in 1980 — Lee found himself using computers more and more in conjunction with sequencers and synthesisers.

"I'm a punter at heart," he says. "I liked the idea of having a computer so I bought a Vic 20. It was that or the BBC at the time, and I didn't want to wait for my grandmother to die and all the other things you had to do in order to get a BBC B."

Like many programmers, Lee decided to write for himself the game he couldn't find in the shops. In his case he wanted Flight Simulation. A flight simulator in 3.5K was always going to be tough, but he had the good fortune to meet up with David Giles and see it published. **Flight 015** spent a good part of 1984 at the top of the Vic 20 software charts.

Lee attributes most of his success to good fortune. "I've had a lot of luck," he says, and drones on about how he is not really a good musician or programmer. "If Russell Harty was to have me on his show in a month's time it would simply be down to luck. My agent's been trying to get me an interview with the *Sun* or the *Mirror* for years. All of a sudden it's 'Rock Star Writes Computer Game' . . ."

On then to **System 15000**, the Spectrum adventure where you play the hacker trying to break into bank accounts and company files. "The truth is, I just thought: 'Hey, how about a hacking game?'."

Convinced that such a game must already exist, Lee asked his friends to scour the world for it. It turned out nobody had yet realised the potential of having a computer simulate another computer. Lee decided to write the game on the Commodore 64. "Paul Vincent helped with the Spectrum version," he says. "The guy deserves a mention."

The Commodore version is in machine code, but the Spectrum program is in Basic. There is no loss of speed. "Basic sounds naff, but I get sick of the false snobbery involved. If Basic maths is just as fast why bother with code?"

The game was also programmed on the Spectrum, with no extra aids such as microdrives or downloading systems. "I believe in not using mainframes," says Lee, as if everybody had an IBM in their bedroom. "Theory and practice are not the same. There is usually a bug you have missed which didn't apply originally but turns up on the Spectrum."

From the beginning, Lee was after complete realism. "The thought was, if you can't do a spaceship properly, then don't. It is a bit limiting, though. The only new game I can think of now is about a television maintenance engineer."

Lee's house in Surrey is full of electronic gadgetry, old computers, monitors, video recorders, movie cameras, photographic equipment, a 24-track mixing desk and other obscure paraphernalia.

"I'm dying for the hardware to get really good," he says. "I can't wait to give the punters something filmic. **System 15000** was the first big game I've done, and it upsets me that I can't do what I can visualise. I've been making films and pretentious videos for years."

He did a video to promote the game for Craig Communications. David Giles and Dick Craig run the company, but the name came out of a private joke on **System 15000**.

The video was intensely tacky, with a heavy disco backing and speeded-up pictures of American motorways with teletext excerpts from magazine reviews. Every few seconds a leather clad model appeared on the screen with the words 'Beat it'.

"It was for a conference of salesmen, and they loved it. They thought we were a really big company."

That sort of production suits Lee's main career as a musician. "The software business and music are similar because the market's the same. Also, two of the important things are hype and money — unfortunately. The growing importance of the hype element is a pity. It's not like the music business in the sixties because then public taste led companies in what they produced."

Lee's experience of the music industry leaves him resigned if not bitter about some aspects of business. "What I don't like is big companies trying to dictate. You don't insult the public's intelligence. **System 15000** is not an insult to the intelligence. If it works, OK. If it doesn't, well, I'll probably lose the house . . ."

Lee regards himself as a maverick in both software and music. He claims to be unpopular within the music industry, and certainly dislikes the conditions retailers and distributors like to make before accepting a piece of software.

"It's like going to see an adult movie. There's an outrageous come-on poster, but when you go inside it's unexciting in every possible way. With some software, you get a pic of immense goings-on and wind up with a blob looking like the detoning sign on a television set."

His lifestyle as a rock artist reflects the style necessary for success in the industry, though he insists he earns no more than his crust as a musician.

"I don't want to buy a Roller," he says, "although I can think of lots of things to do with money. We try very hard to give the appearance of wealth on the business side. Those people don't buy failure."

Lee tends to get up in the afternoon, and this interview was conducted in the small hours of the morning, fortified by drink and food ferried into the plush, stylish living-room by Angela and Pip, the two women who live with Lee. "Pip runs me," he says, simply. "She organises everything. Angela sings in the act."

He orders the girls about with the sensitivity and politeness of a rhinoceros, but the girls do not seem to object. "I do a lot for Lee and he does a lot for me" says Angela, while Lee is out of the room. "I'm not a feminist."

Maybe it is all part of the act, the image of what is expected of a star. "Listen, mate" growls Lee. "I've got more front than Selfridges."

Lee dislikes being labelled. "I no more think of myself as a programmer as I do a singer. It is the end product which counts, and whether it's entertaining. Programming to me is more like having your teeth drawn than for someone who lives and breathes inside a micro. As long as it looks great, I don't give a damn. A programmer's job is not to be arrogant about programs, it's to produce a good game."

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Mind you, there is no doubt Lee would dearly love to be famous in his own country. "There's a compilation album in America I found by accident. On the jacket it says 'With Lee Kristofferson's semi-legendary dance hall stroll smash, *Night of the Werewolf*. What's the point of being semi-legendary? One day I'll be really legendary."

He has every intention of writing a sequel to **System 15000**, which would involve getting your revenge on the computer criminals by defrauding them. In the original game you simply have to rectify their crimes. However, the sequel depends upon the success of the first game, and although reviews have been uniformly good the distributors and retailers are suspicious of an adventure radically different from the norm.

In Germany, where Lee is well known for his music, the game has been much more successful. Particular fans are members of the NATO base at Osnabruck.

"They got in touch because they wanted some help. Phoning a NATO base is complicated, it's not just a phone book job. The conversation was amazing: 'Have you cracked the code for SELCRA yet? No? Then try . . .' I thought, what if the phone is bugged? MI5 will boot the door in and I'll get arrested and become a star . . ."

He says he has no intention of launching a dozen games just to beef up the catalogue, and pulls out a rack of cassettes to indicate he has written plenty. As far as he is concerned, they are not good enough, or not what he wants.

Has he thought of doing something like Automata's **Deus Ex Machina**, which carries a full musical tape with the game? "It's a very brave attempt . . . no, that sounds patronising, and I don't mean to be. It's a brave attempt to break new ground in a mixed media sense and . . ." Lee cracks up at the sound of what he is saying, and then pulls himself together. "Yes, I'm very interested but we cannot do it yet. The hardware isn't available. It has to be right."

Just because Lee is writing games does not mean he has given up music. He plugs his new album in the style of all good interviewees. It is called *The night time is the right time*. Lee sings, plays guitar and keyboards, and has a group of girls doing, well . . . "They're like a backing group going do-wop, but instead it's a fronting group not going do-wop. When I record I use one other musician. But if something requires a really good saxophonist, then I'll get a really good saxophonist, or whatever."

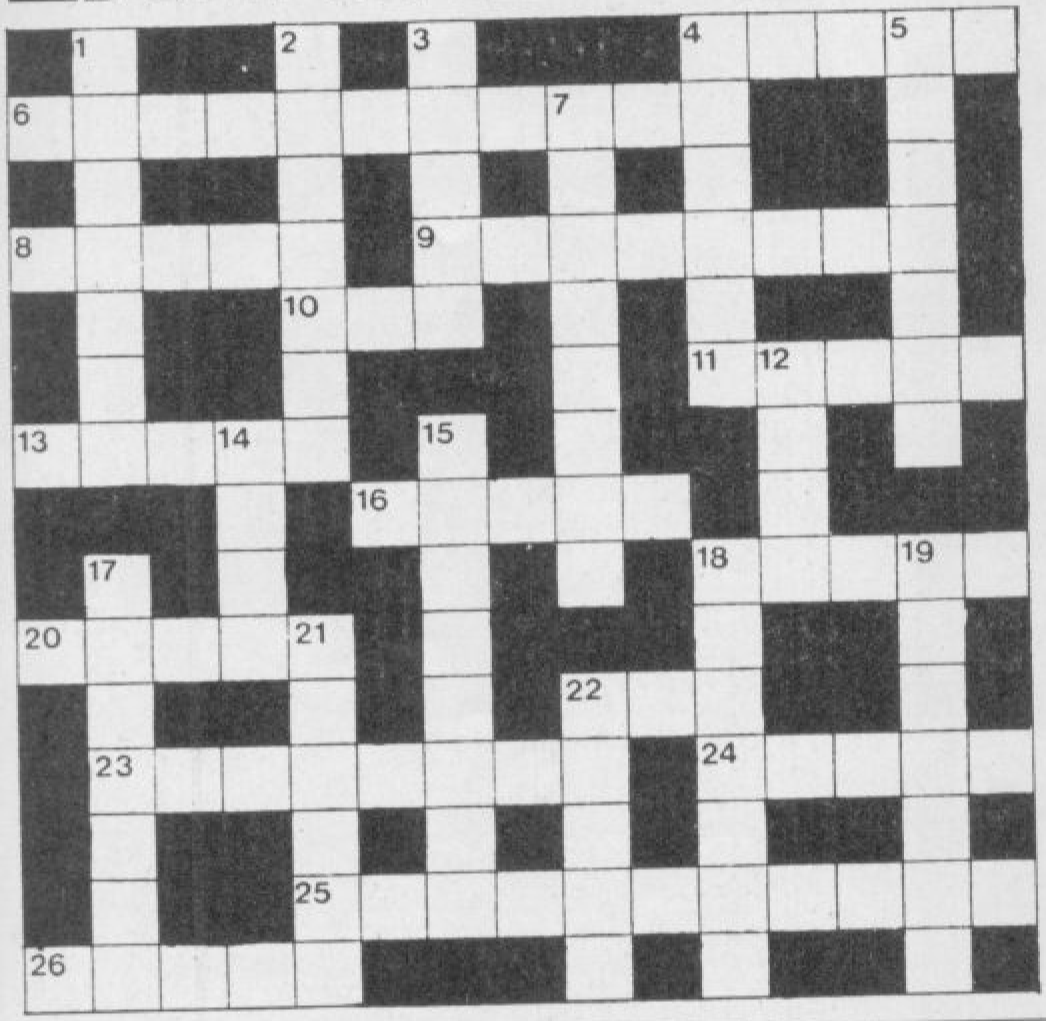
If **System 15000** takes off to the extent that it deserves, he will need a good accountant as well. In the meantime, the company motto is 'have fun until they throw away the keys.' "Look, I'm into entertainment, that's all. Just like you are, mate. We're both showmen."

Rock on, man.



ZXWORD

by Henry Howarth



Across

4. 65,83,67,73,73 ? (5)
6. Machine with Doctor Ives' auxiliary devices (11)
8. Pick cell on the screen, by the sound of it (5)
9. Coach to return to the QWERTY keyboard? (8)
10. How to get all the colours of the Spectrum from pinks (3)
11. One is bothered by interference during transmission (5)
13. Magnetic media for mainframe percussionists (5)
16. Gaming jet-setter (5)
18. Computer or can company (5)
20. Go by bus to return in Basic (5)
22. Doctor in a space on tape (3)
23. A Sir in CAL? (8)
24. For starters, lots of graphics in colour makes sense (5)
25. Sued refined sort of character (4-7)
26. Joy-stick fatigue? (5)

Down

1. Currently, it prevents excessive signals (7)
2. Nasty globs in many an adventure (7)
3. Follow on disk (5)
4. Use LET like a symbol (6)
5. NOT prose! – just the opposite (7)
7. Real string control, for example, is changing (8)
12. Micro in historical setting (4)
14. Choice page for the lads, you hear (4)
15. Fine male for ruining entry in program catalogue (4,4)
17. Ten ROM's corrupted by very large bug (7)
18. May flip over to boost the signal (7)
19. Mathematical roots are sacred, I find out (7)
21. Copy for safe-keeping and support (4,2)
22. Raged about hardware improvement when up (5)

Solution on page 142

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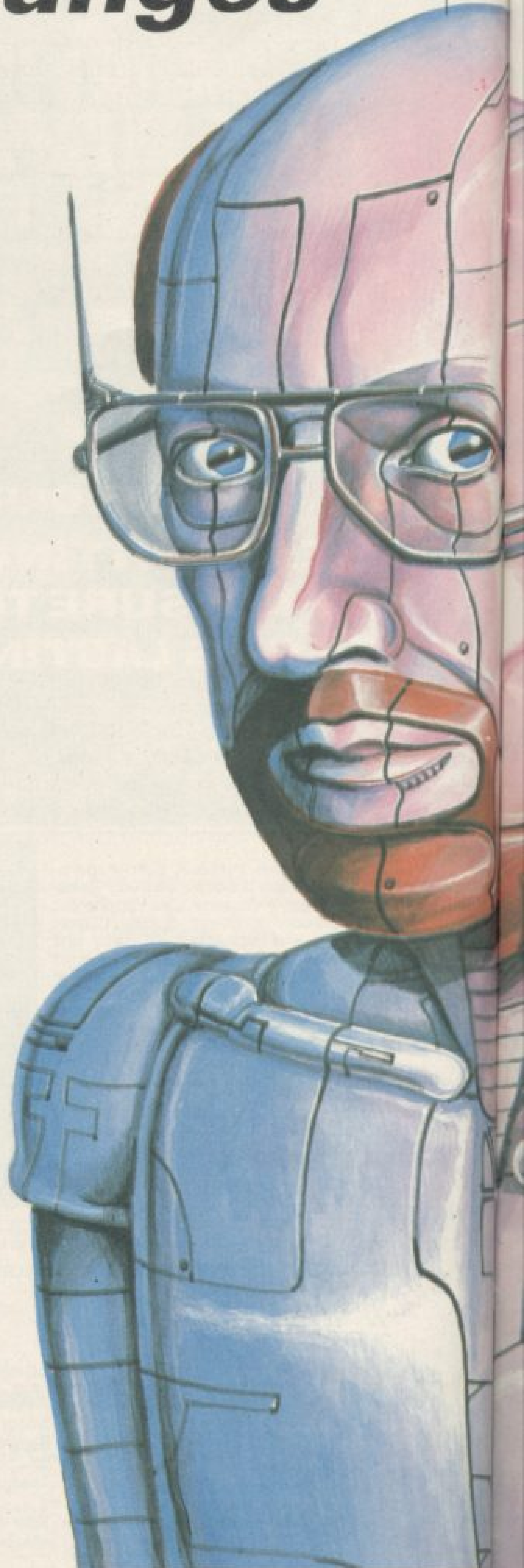
"I am a radical. I want to see a lot of changes"

Sir Clive Sinclair talks to Bill Scolding about his plans for Sinclair Research and the world at large

"I DON'T KNOW how to persuade people of my dream." Thus laments Sir Clive Sinclair, pioneer and proponent of the Fifth Generation, the thinking machine's man.

The controversy over Artificial Intelligence, previously confined to academic and scientific coteries, is now raging on television, radio and in the national press. Battle has been joined, too, in the pages of *Sinclair User*. Can mankind, and should mankind, take on the role of God and breathe life into a super-intelligent being? What are the consequences if man succeeds?

In an attempt to put the record straight, Sir Clive talks to *Sinclair User* about the future he is building and in which we will be living.



New QL

We start, however, with the more immediate future, and Sinclair Research's plans for 1985. Rumours of an improved QL, with ROM based software and retailing at around £500, have got the new year off to a traditional, speculative, start. Sir Clive has no intention of being pinned down: "We haven't made any such announcement." Does that mean he denies it? "No, it means nothing of the sort."

Sir Clive is an old hand at these tactical exchanges; the phrasing becomes all-important. If such a machine was to appear, would upgrades be offered to owners of the old QLs, rather in the manner of the 16K Spectrum upgrades? "I've no idea . . ." He considers the wisdom of that. "It must be possible to do it and . . . yes, we would do it. Yes, absolutely."

Portable Spectrum

Unsure as to where that leaves us, we pass on to safer territory and the much-talked about portable computer, which is to include an in-built microdrive, a flat screen display and a real keyboard, and cost about £300. Sir Clive does admit to something along those lines. "It's not yet had the button pushed because we're still doing some work on the display, and until we have a display we're satisfied with we can't go ahead."

Ah, the controversial flat-screen display. Haven't there been some problems with it, such as the picture being unstable? "I don't know," Sir Clive shakes his head, exasperated. "There seems to be a move around to knock our products. The flat screen display is the best in the world, in terms of 2" flat screens. Absolute wonder of technology. We haven't had a single complaint . . ."

Some critics have suggested, nevertheless, that perhaps a liquid crystal display . . . "They must be out of their tiny minds! God! I've yet to meet anybody who thinks a liquid display is anything other than awful." But there have been production problems with the screens. "When you're building a plant that's always the case. Again, it's the bloody press trying to find something at fault. We have the most modern production plant in the world. Highly automated. Perfect tubes."

Microdrives

It has been well over a year since the microdrives were launched and there is still only negligible software available. Sir Clive is quick to accept responsibility. "That's our fault. We haven't been able to make enough microdrive cartridges available. The plan was to get the microdrives out there and then to get the demand right up and the price right down. At the moment they are not attractive to software houses."

Isn't Sinclair Research spreading them a bit thinly at present? ICL is using them, the QL does too and even the planned portable is to have a drive built in. "It's getting overwelmed by its own success," says Sir Clive ingenuously. "We are only holding the price up artificially to restrain the market until we can meet it."

A bizarre remark, when Sir Clive acknowledges that the microdrive Expansion Pack promotion was an

attempt to encourage the market to take an interest in the beasts again.

Sinclair sales

It's time for the old chestnut. When will the Spectrum come down in price? "Hah! The old answer is the same. No plans to do so."

Sir Clive leans forward, earnestly, "This will sound like a sales story, but it's true. This Christmas sales of micros have gone down, with one exception — sales of Spectrums are better than last year. We are oversold; we can't supply as many Spectrums as the stores want. A hell of a lot more than last year." He's right, it does sound like a sales story. What proportion of those are Spectrum Pluses? "We're shipping rather more Pluses than Spectrums. It's about 60-40."

By bringing the Spectrum+ into the Commodore price range Sinclair Research has invited comparisons between the two machines, whereas before, the Spectrum had a clear advantage in price. The Commodore 64 offered features which might seem attractive to the customer — sprite graphics, enhanced sound, arguably a superior keyboard.

"We wanted that to happen," says Sir Clive. "When you compare the machines the Spectrum is actually the more powerful. There is more available RAM."

The Commodore 64 is nevertheless at the top of some charts — notably in *Personal Computer News*. "That's completely false! We out-sell Commodore by two or three to one."

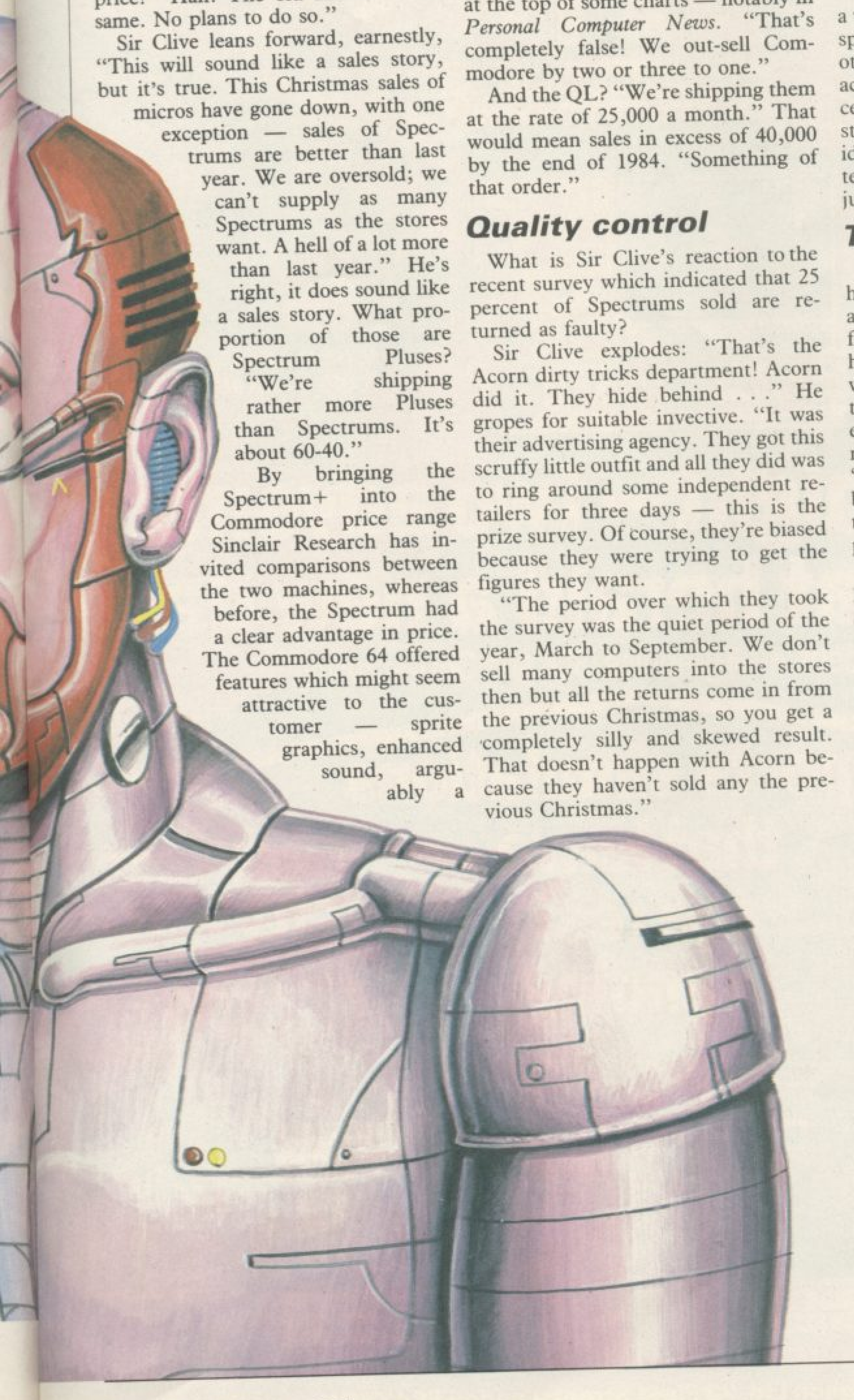
And the QL? "We're shipping them at the rate of 25,000 a month." That would mean sales in excess of 40,000 by the end of 1984. "Something of that order."

Quality control

What is Sir Clive's reaction to the recent survey which indicated that 25 percent of Spectrums sold are returned as faulty?

Sir Clive explodes: "That's the Acorn dirty tricks department! Acorn did it. They hide behind . . ." He gropes for suitable invective. "It was their advertising agency. They got this scruffy little outfit and all they did was to ring around some independent retailers for three days — this is the prize survey. Of course, they're biased because they were trying to get the figures they want.

"The period over which they took the survey was the quiet period of the year, March to September. We don't sell many computers into the stores then but all the returns come in from the previous Christmas, so you get a completely silly and skewed result. That doesn't happen with Acorn because they haven't sold any the previous Christmas."



Pausing for breath, Sir Clive continues. "We know what our returns are and we're not proud of them. We get 13 percent returned, and that is high. But over 40 percent have no faults found, and a lot of the faults are very trifling.

"We are selling a lot of machines to a very young audience, bloody good at spilling Coca Cola over them and otherwise messing them up. The actual returns are nearer seven percent." He ponders. "Maybe the instruction manual could be better." An idiot's guide to plugging in a computer? "The Spectrum+ instructions are just that."

The market

Pessimists are saying that the UK home computer market is fast approaching saturation point. Manufacturers now have to break out of the hobbyist market and convince people who wouldn't normally buy a computer that it is something useful — even essential — for the home. "I think the market has peaked," Sir Clive agrees, "and will decline in terms of hobbyists. It's a feeling I've got that the time has come for serious computing."

Not, then, diary programs, telephone directories, recipe planners, gardening books . . . "We're all fooling ourselves if we think we're going to sell a lot of machines on that basis."

Micros in schools

The government scheme for placing computers in primary schools finishes in January. Like the secondary school scheme, it has not been considered a great success by teachers, who feel that schools suffered because of the promotion of the BBC micro, much more expensive than the Spectrum. Not surprisingly, Sir Clive concurs. "The whole BBC business was outrageous, and I'm very sad that it lost the country the coherence it might have had."

The government has been strangely pleased with the scheme, claiming that the school children of today are the first generation of the computer literate. Sir Clive laughs. "I think it's a question of not being frightened of computers. It's not that we want them all to be able to program but to be able to use the machines. Realistically, a lot more has been done for computer literacy through the sales of machines to play games on than anything the schools might be able to do."

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Silicon Nightmares

At last we come to the matter of Sir Clive's speech to the US Congressional Clearing House on the Future, and the reply by Alexander Macphee in the November issue of *Sinclair User*.

Sir Clive is not amused. "It was a silly article, outrageous really. He had misquoted what I'd said . . . or misinterpreted it. He just doesn't want to believe."

One point with which Macphee disagreed was the suggestion that 'our lives will parallel the lives of the Freeman of Athens. Sir Clive shrugs, "OK, that's the difference between optimism and pessimism. I'm optimistic and I believe that can happen and he's entitled to say he doesn't, but what's the point?"

There is a point. Sir Clive is in a position to shape that future and to be optimistic isn't enough, he must be confident that the consequences of his actions will be beneficial. Apparently, he is. "I speak from some knowledge. I know that technically we can make a machine as complex as the human brain. I don't know that we can make it do what a human does but I think it's very likely that we can.

"If one day we can make machines with human-like intellect but free of human frailty, then in a sense we will have servants in the way that the Greeks did. We'll have the sort of intelligent beings which everyone can trust; the Russians can trust them, and the Americans too. They will be without guile.

"I strongly believe we can have a better world for it. Imagine, you could put one of these wondrous creatures down in the middle of a village in India, to look after the people there, to teach them . . . oh, I don't know . . ." His voice tails off; perhaps he, too, is momentarily stunned by how naive and patronising that sounds.

"What I don't know is how to persuade people of . . . my dream." He is silent again.

Unemployment

In his speech, Sir Clive acknowledged many people would be 'unemployed and very miserable' as a result of increasing computerisation, but it would be only 'a temporary pattern'. How temporary?

"I think we will have a long bitter period now — the next five years — when unemployment will remain high, and then it will decline again. People want to work . . . It's not that new jobs aren't being created; they're being created faster than ever. Employment will cease to be a worry of the 90s."

If that's true, then education must change dramatically from what it is now, to gear people to fill the kind of jobs vacant in the future. "Education is going to have to change very much. We've got to give children taste and we've got to teach them to be self-reliant."

That couldn't be further from what is happening now. Sir Clive agrees, "I'm very worried. I was on television the other day, saying exactly the same thing."

Big brother

Sir Clive dismisses fears of an Orwellian society, a tyranny of machine surveillance, yet the misuse of technology is rampant today. "Absolutely. I don't mean that technology is not misused. God knows it is in Russia."

> **"We will have the sort of intelligent beings which everyone can trust"**

Isn't it rather like inventing a gun, giving it to some supposedly responsible, and saying 'It's loaded, just don't point it at anyone.'?

"No, it isn't like a gun, it's like a car. You've got to be careful with it but it can take you all sorts of places. It's true that things can be misused and I wouldn't be talking to Congress and talking on television if I didn't think we need to prepare for it."

Science fiction

Some of Sir Clive's wilder ideas would not be out of place in the novels of Arthur C Clarke or James Blish. Has he been influenced by science fiction? He smiles. "Yes, as a child. I still do read some but I don't have much time."

Isn't he disappointed that the world of the 80s is so shabby compared to what it should have been like? "I know, but on the other hand . . ." A long pause, while he tries to locate the other hand. He sighs. "Yes, it is rather disappointing. We've all got televisions and what have we got to watch but a lot of rubbish." And we've all got computers and we're playing **Jet Set Willy.**

Sir Clive thinks again. "It's disappointing so far but it's getting better . . . Average people can travel to the continent or the States, things which they could only dream about before."

What about the Third World, the famine in Africa? What price progress? "So many governments don't look after their own people; they misgovern to such an extent. It is depressing because some things are done so well. The eradication of smallpox — an unbelievable achievement. India now feeds herself. China is an exporter of food. There are appalling slips back in Africa and South America but it is not all loss."

Political colours

"I believe very, very, strongly in free enterprise at a small level. I also believe very strongly in the need for a major overhaul in a lot of our institutions . . ."

Sir Clive warms to his subject. "Why do we need three separate forces? It's quite barmy. And what do we need them for in the first place? Are we going to fight more wars? I hope not. All you need is a bigger police force which can be turned to the defence of the nation in emergencies. So, I'm a radical. I want to see a lot of changes.

"Mankind does act selfishly, but that doesn't mean there isn't altruism in people. Things will work out best if they're allowed to. That is a kind of conservative viewpoint — an Adam Smith viewpoint. I don't believe you'll get a worthwhile society if you plan altruism into it. I believe in libertarianism.

"I wouldn't say I was right wing, but I'm certainly not very left wing either. Middle of the road in most things, but very radical. I'm very dissatisfied with British society as it is today."

The future

The father of home computing in this country, and the father-to-be of the next generation of machine marvels, shakes hands and the interview is over. Mad scientist or industrial revolutionary, entrepreneur or prophet, Sir Clive Sinclair is pressing on regardless, building brave new worlds and carving a niche for himself in the history books.

Only the future will tell us whether his endeavours are misplaced. By then, of course, it will be too late.

What goes one behind the SCREEN$?

Michael Spencer describes the display file and how to use it

THE SPECTRUM, in common with most other home computers, has a bit-mapped screen display. Understanding of the layout of the display is essential for good machine code programming and can also be useful for Basic programming. You are normally unaware of that area except for the knowledge that it can be saved to tape using the SCREEN$ qualifier to the SAVE command. You may never bother finding out about the details of the layout unless, like many people, you are interested in writing an arcade game when you will need to know. Many people are put off at first by the apparent complexity. A little perseverance will pay dividends and may make life a lot easier when tackling your first screen-based game.

The Spectrum is capable of displaying a 32 column by 24 line screen. Both dimensions are numbered from zero, that is 0 to 31 and 0 to 23 respectively. If you study each character carefully you will see that each one is made up of little dots. Those dots are known as 'pixels'. It takes 64 pixels to make up one character position. Not all are used at once, though they are all there, but just enough to convey the shape of the character. Given the character size of the screen it is easy to see that the screen is 256 by 176 pixels. That is the high resolution display. It should be noted that the bottom two lines cannot usually be used, these are the input lines.

The screen display is held in a part of the memory which can be altered — the RAM. All bytes can be subdivided into bits. Each byte in the Spectrum, and many other computers, has eight bits. Each bit can have the value nought or one. That can also be taken to mean on or off. Each bit can represent a successive power of two. Two bits can hold values up to three, three bits can hold values up to seven and a full eight bits up to 255.

Each pixel on the screen has a one-to-one relationship with a bit in the memory. Each bit is said to map onto its corresponding pixel — hence the term bit-mapped display. Each character is made up from 64 pixels. Those pixels map onto eight bytes. The character is eight lines of eight pixels. As there are 768 characters on the screen there must be 6144 bytes involved. Any alteration to a single bit will result in a corresponding alteration on the screen. The screen memory is fixed from 16384 to 22528.

To prove that clear the screen with a CLS command and type:

POKE 16384,255

The POKE will alter the value held for the first pixel line of the first character to all ones — in terms of single bits. That has the effect of a line across the top of the character position. To change the whole character position eight such POKEs are needed. That is not at all straightforward because the characters are held in a very peculiar way. To change the first character position to a capital A type in the short program in figure one.

There is no top-left bottom-right arrangement as might have been expected. To prove there is an odd arrangement type in the program in figure two, which POKEs the first three thousand bytes.

As can be seen when that program is run, all the top pixel lines in the top third of the screen appear first, followed by the second pixel line of those characters in the same third and so on until the top third of the screen is complete. The sequence is repeated for the middle and bottom third of the screen. That means addressing the screen via the display area is not always easy.

Using Basic all that is needed to print a capital A on the screen in the first character position is:

PRINT AT 0,0;"A"

That one line achieves the same as the eight POKE lines in figure one. The character A could have been placed anywhere on the screen. That means there must be an algorithm to work out which locations in the display area to alter. An algorithm is a process, or rule, to calculate the bytes. That process is part of the operating system built into the ROM. To make any proper use of the display area the layout needs to be fully understood.

```
10 REM PROGRAM 1
20 REM POKE FOR "A"
30 REM TO LINE 0 COLUMN 0
40 CLS
50 POKE 16384,BIN 00000000
60 POKE 16640,BIN 00111100
70 POKE 16896,BIN 01000010
80 POKE 17152,BIN 01000010
90 POKE 17408,BIN 01111110
100 POKE 17664,BIN 01000010
110 POKE 17920,BIN 01000010
120 POKE 18176,BIN 00000000
130 STOP
```

Figure 1.

Consider the area as thirds, which has been demonstrated by POKEing the first three thousand bytes. The first third runs from 16384 to 18431, the second from 18342 to 20479, and the third from 20480 to 22527. Those thirds correspond to lines 0 to 7, 8 to 15 and 16 to 24. The total area is 6144 bytes long, each third is 2048 bytes.

```
10 REM PROGRAM 2
20 REM SCREEN DISPLAY
30 REM DEMONSTRATION
40 CLS
50 FOR I=1 TO 3000
60 POKE 16383+I,255
70 NEXT I
80 STOP
```

Figure 2.

The details of all the top pixel lines of all lines in the first third of the screen are held first, followed by the second pixel lines and so on. To determine which bytes to alter for a given character position on the screen is a matter of finding which third of the display file is involved. It is then relatively simple to find the addresses of the bytes involved. The program in figure three illustrates such a method.

It is also possible to calculate which bytes to alter by using only pixel coordinates. However, it must be remembered that only a single bit is involved rather than a whole character position. If only one bit is to change then the other bits in that byte need to remain the same. That can be done by careful addition and subtraction. It is easier to do in machine code.

So far we have dealt with only the display area and the state of the pixels. The character shapes are stored in ROM. The attributes of each character position are also held in RAM immediately after the display area. The attributes include: paper colour, ink colour, and whether the character position is steady, flashing, bright or normal. It should be immediately noted that this information is held only for the character postions and not for individual pixels. That is why

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there can only ever be two colours in any character position. There are 768 attribute bytes in the attribute area. All the information about a single character position seems rather a lot for one byte to hold, and as each byte is made up of eight bits each bit in the

```
  10 REM PROGRAM 3
  20 REM CALCULATE BYTES FOR A
  30 REM CHARACTER POSITION
  40 DIM A(8)
  50 INPUT ROW,COL
  60 IF ROW<8 THEN  LET START=16
384
  70 IF ROW>7 AND ROW<=15 THEN
LET START=18432: LET ROW=ROW-8
  80 IF ROW>15 AND ROW<=24 THEN
 LET START=20480: LET ROW=ROW-16
  90 LET RBYTE=ROW*32
 100 LET CBYTE=COL
 110 LET J=0
 120 FOR I=1 TO 8
 130 LET A(I)=START+RBYTE+CBYTE+
J
 140 LET J=J+256
 150 POKE A(I),255
 160 NEXT I
 170 STOP
```

Figure 3.

byte has a meaning. The bits are numbered from the righthand end, known as the least significant as it represents the least power of two. The lefthand end is the most significant as it represents the highest power of two — two to the power seven. The rightmost bit is numbered 0, the leftmost 7. Bits 0, 1 and 2 determine the INK colour which is in the range 0

```
  10 REM PROGRAM 4
  20 REM SCREEN MANIPULATE
  30 REM COPY TOP THIRD
  40 REM TO MIDDLE THIRD
  50 FOR I=0 TO 255: PRINT "A";:
NEXT I
  60 FOR I=1 TO 2048
  70 LET A=PEEK (16383+I)
  80 POKE 18431+I,A
  90 NEXT I
 100 STOP
```

Figure 4.

to 7, and bits 3, 4 and 5 determine the PAPER colour. Seven is the maximum value which can be held in three bits. The remaining information is held in single bits, as only an 'on' or 'off' state is needed. Those bits are used to hold the bright/normal — bit 6 — and flashing/steady — bit 7 — states. Normal and steady are the off states, or value 0.

The layout of the area is one-to-one with the characters on the screen and also serial. Byte 345 holds the attributes of the 345th character on the screen counting from top left to bottom right. That makes it very easy to alter particular character attributes.

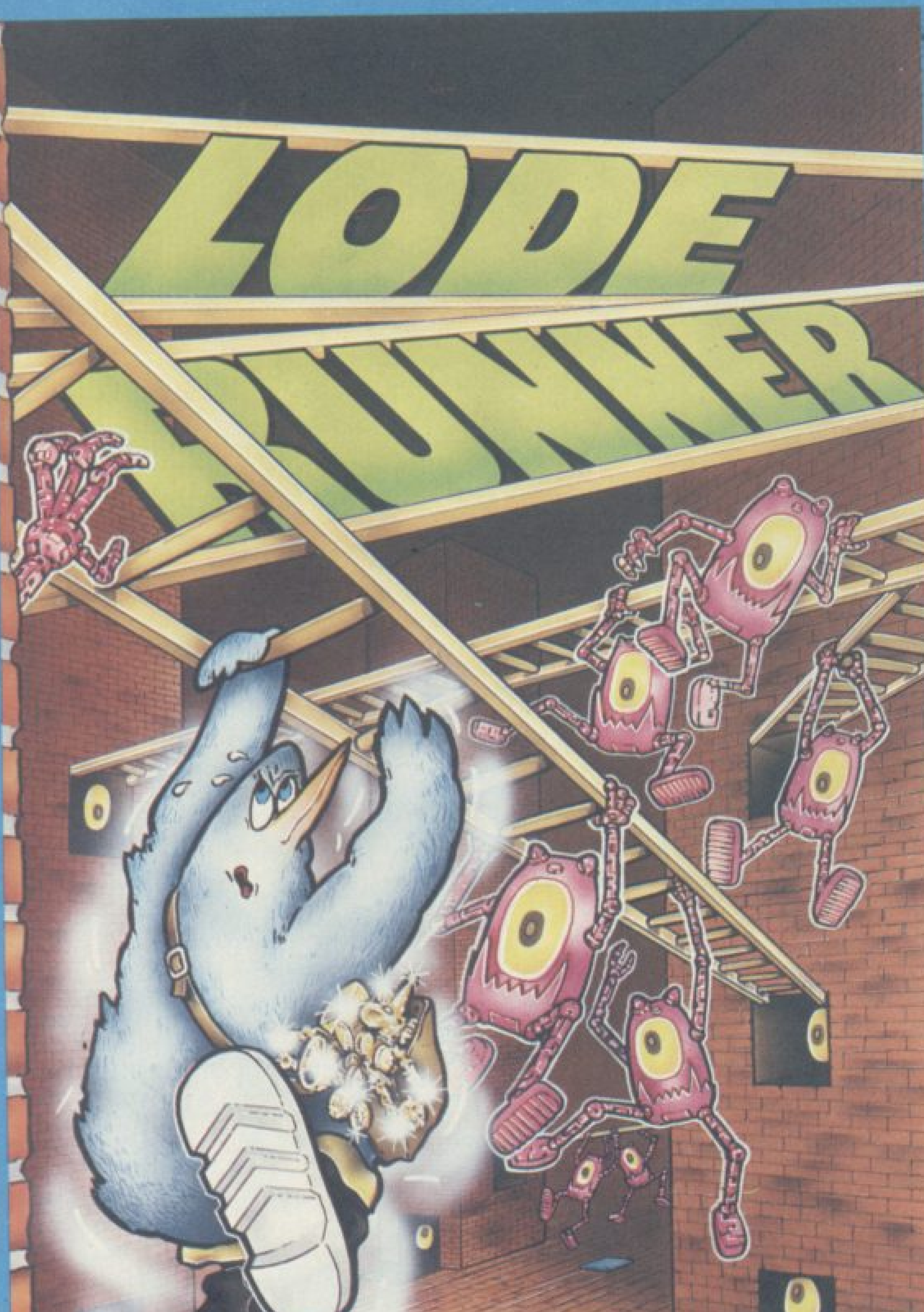
Once the layout of these two areas is known, what practical use is it? For a fast moving arcade game Basic is far too slow. Animating the screen requires a good speed of execution, and copying whole areas of the screen can be painfully slow in Basic. The program in figure four writes the character A to the top third of the screen and then moves a copy of the top third to the middle third.

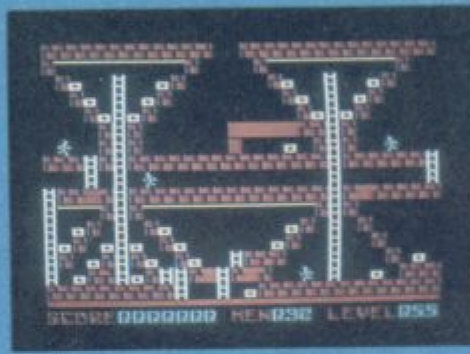
The copy is very slow in comparison to the machine code version in figure five. The program creates the character A as before and then enters a very

```
  10 REM PROGRAM 5
  20 REM HIGH SPEED SCREEN COPY
  30 REM COPY TOP TO MIDDLE
  40 CLEAR 60000
  50 DATA 33,0,64,17,0,72,1,0,8,
237,176,201
  60 FOR I=1 TO 12: READ A: POKE
 59999+I,A: NEXT I
  70 FOR I=0 TO 255: PRINT "A";:
NEXT I
  80 RANDOMIZE USR 60000
  90 STOP
```

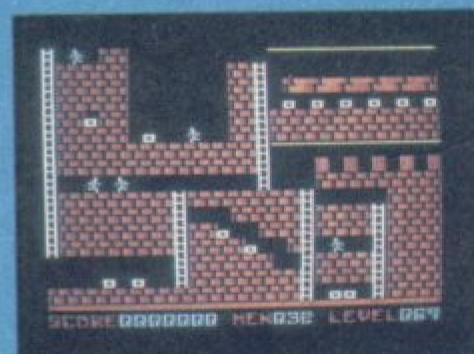
Figure 5.

short machine code program which copies the top third to the middle third of the screen. It uses a simple block move instruction to do that. As can be seen when the program is run, it is very fast indeed, this is generally true of all machine code programs and is the reason why all the successful arcade games are written that way.









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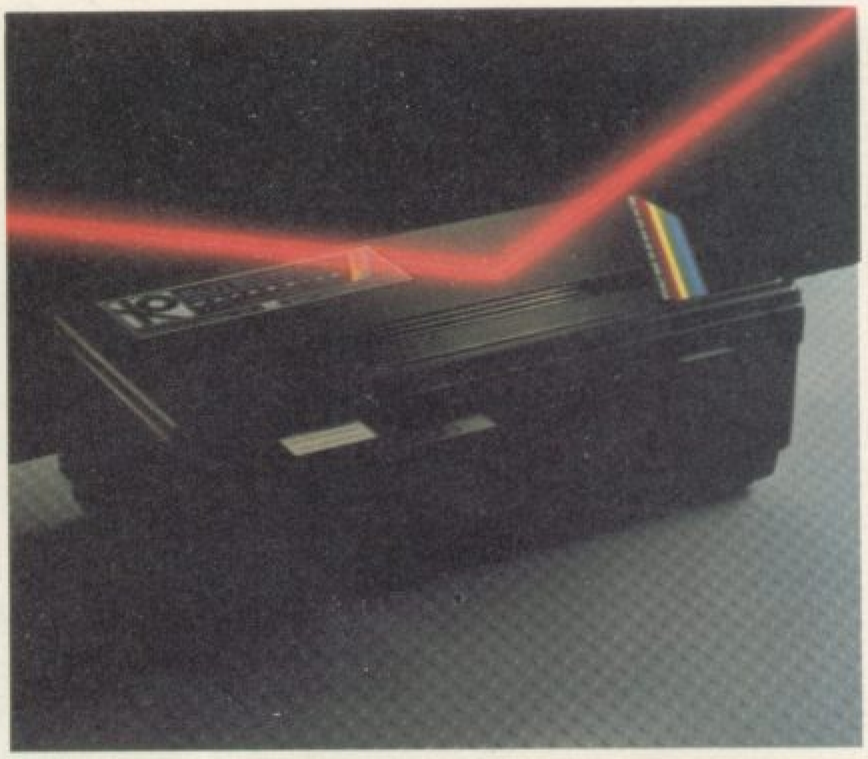
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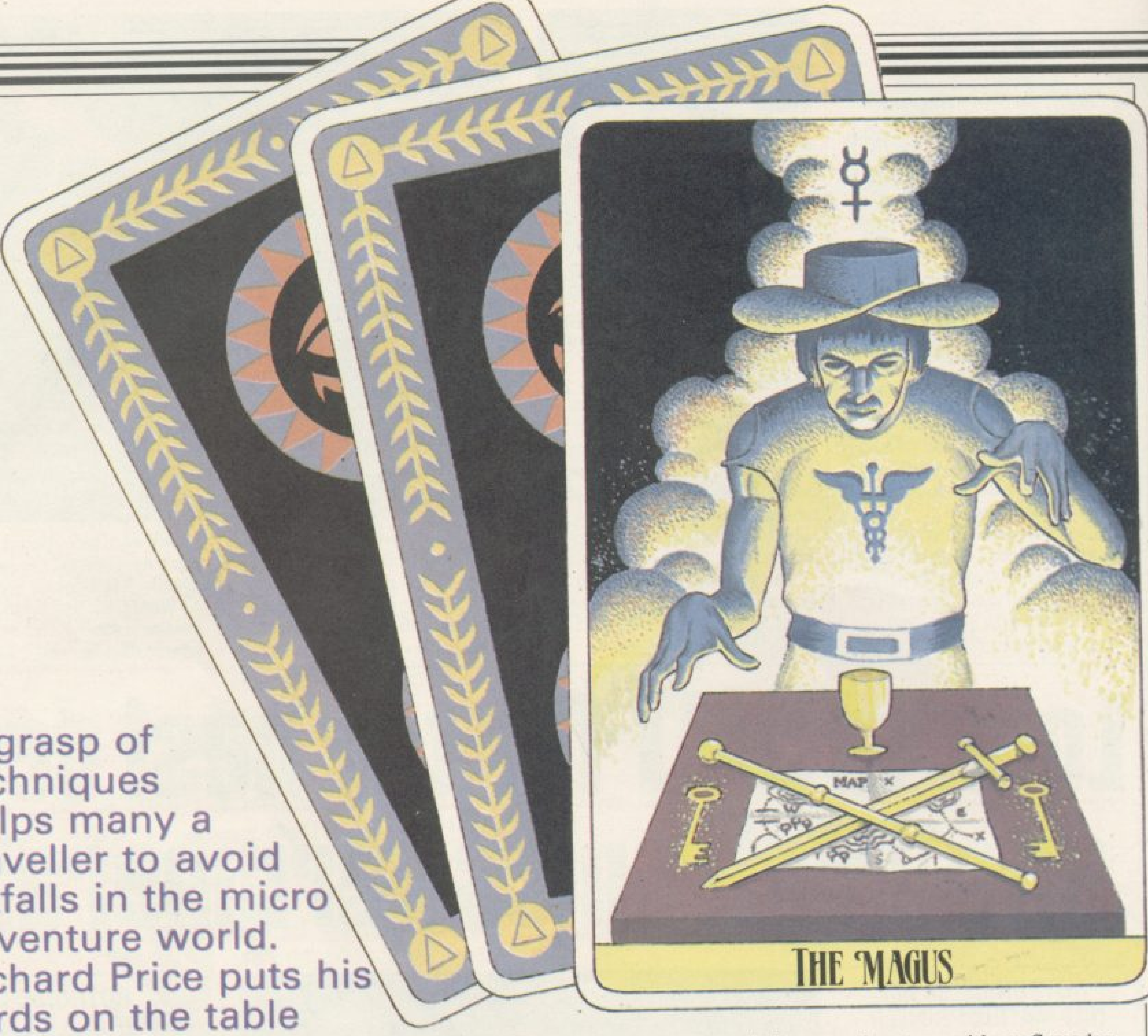


Illustration: Stuart Briers

A grasp of techniques helps many a traveller to avoid pitfalls in the micro adventure world. Richard Price puts his cards on the table

Tales of the unexpected

THE STRANGE LANDS of adventure are full of unknown perils. Survival depends on your skill in interpreting and handling new problems and relationships. Impulsiveness and bone-headed agression will end in a miserable death in some misty corner of those foreign fields.

Like any traveller into uncharted territory, you must prepare yourself for the dangerous and mysterious realms ahead by developing habits and ways of thinking which will carry you through to eventual triumph. Be persistent, enquiring, careful — and be ready for the unexpected. Remember, someone or something out there wants to get you very badly.

Whatever else you do or don't do beyond the frontier there is one thing you cannot do without — a map. Navigation without one is like climbing Kanchenjunga without a rope.

There are few games which use randomly set locations so even if objects and non-player characters shift you should have graph paper or a sketch pad to hand. On arrival at a new location draw a box or circle and mark all the known exits, along with any other information you think is worth remembering. If you drop — or are forced to leave — anything there is always the chance you will need it further on. Your detailed map will help a speedy return without floundering or running into unnecessary trouble.

The sadistic streak in the hearts of most adventure programmers means there will be times when keeping a coherent chart seems well-nigh impossible. Just when everything is going fine you find yourself lost in a warren of identical locations.

The featureless maze has become something of a tradition in text adventures and can still cause panic or hysteria in hardened veterans. The maze usually serves some purpose — it may hold a treasure of importance, as does the endless industrial estate in **Hampstead**, or it may be the route into the next set of locations. **Orc Slayer**, a reasonable example of the sword and sorcery genre, throws you into a maze within a few moves of starting and you must find your way through to enter the main part of the game.

Whatever its purpose, it is essential to face the grim reality and get down to working out the plan of your

Illustration: Stuart Briers

labyrinth — running away will do no good. In fact, most mazes can be explored easily and contain very few locations.

Before entering the maze it is worth having as many objects with you as you can carry. They will act as markers on your route and can be recovered when you have mapped the maze successfully. At the first location in the maze drop an object. Then test each direction for possible exits.

If you type in 'North' and the screen display still shows the object as present you will know the way north is blocked. Do the same for each direction including up and down — you never know. When you find you have changed your location drop another object and repeat the procedure.

Sometimes you will find that you cannot return the way you came — programmers will often jumble compass directions. Stick to your routine despite intense provocation and, nine times out of ten, you will eventually find your way around, often returning to your starting point. Mazes will soon become terrors for mere children, provided you create fixed points by dropping objects and exploring outwards — just remember Theseus and his ball of string.

There you are, deep inside your terra incognita with each step a threatening event and each location needing exploration for useful information or objects. Don't expect the programmer to make life easy for you. In a well crafted game the description will not contain every item of available information about the room and its contents. Search the area very thoroughly, testing the walls, floor and ceiling for hidden exits. Dig holes if you can and pull, push or thump anything likely to be movable.

Many games will show different results for similar commands. In **Sherlock Holmes** 'examine' may deliver little of interest. Add 'closely' to that request and much more may be revealed. Search, examine and look should all be used separately and then only omit such a command when you are certain the interpreter does not understand it.

Repetition of actions is always advisable. After you have performed some apparently useless action enter 'look' — or the program equivalent for redescription, you will find occasionally there has been an effect — without that second attempt you would never have known. It pays never to make assumptions or to take situations for granted.

Simply hanging around may, paradoxically, get you somewhere. To negotiate the forest path safely in **The Hobbit** it is essential to wait twice at each location and, of course, the only way to defeat the trolls is to wait for dawn in a safe place. In interactive games, where characters wander about, it is sensible to do that regularly. Dangers ahead can be avoided, or you could run into a character you have lost and from whom you need help.

Listening is also important — on occasions you could well be forewarned of an approaching threat or even given valuable secret information. Within a few moves from the start of **Mountains of Ket** there is a hint about hearing voices nearby. Listen carefully at that point and you will receive a password which will pacify a dangerous orc sentinel at a later stage.

If your game has graphic illustrations of the locations study them carefully — clues could well be present, especially if it is a program with pictures which alter after relevant commands. At a lonely snow-bound hut in **Valkyrie 17** the picture contains the only clue that essential objects are present.

Sooner or later there will be times when you are entombed or imprisoned. Try every object you have with you — throw, drop, use, rub, even eat them. Something might work. In **The Final Mission** of the Ket Trilogy you begin by being locked up in the evil Vran's murky dungeons. Escape from the first cell is easy but you find yourself trapped in yet another. If you drop one of your very few possessions the door will open to the vast halls of the enchanter's fortress. That sort of lateral thinking — often combined with sheer desperation — is crucial in adventuring and you can expect to make little progress without it. Level 9 specialises in that sort of approach and the games are very rarely based only on the collection of significant objects; your score depends on solving puzzles and not in undertaking shopping expeditions.

Travelling abroad is more than simply a matter of exploring exotic places. The realms of adventure are populated by weird creatures ranging from dyspeptic and irascible dragons to cocaine-crazed ace detectives. A few are ordinary human beings but in the main they are sub-human, mythical or bestial. Some are just plain odd, like the bizarre En monster in **The Final Mission** or the prudish Mary in **Valhalla**.

Unless a game uses complex personality matrices — and there are few of those — most of the inhabitants you will bump into will be short on brain power and programmed for specific purposes; they will either help you or do their best to separate your head from your shoulders. Often they are capable of both, but if you behave like a boorish deadhead, and rub them up the wrong way with your input buffer, you will only have yourself to blame when you are cloven from top to toe or lasered into subatomic particles.

Look at it this way; when on holiday you will probably make an effort to understand the locals and behave in a courteous and reasonable fashion. Picking fights gets you slung out of a bar in Torremolinos and much the same applies in adventures. If you go in waving your battleaxe you are unlikely to get much information or help.

Be nice — to start with, at least — and say hello. Rummage around in your pack and offer some useful, though preferably inexpensive, present. Those gifts might persuade the creature to divulge a secret or perform some service for you.

You will often be surprised at the results. The reluctant hero of the Ket Trilogy runs into orcs and their kin on his journey. Almost all of them can be dangerous if provoked and fighting will diminish your stamina and luck points — absolutely essential for getting through to the world outside.

Although the orcs possess singularly unattractive peronalities the game is sufficiently well designed for them to have their own needs. With ingenuity and common sense you can end up with a stash of treasure by striking deals rather than indulging in hand-to-hand combat. You should discover a lonely ogre who has his own little vice. By using your dice you can win an extremely useful piece of equipment — if Lady Luck smiles on you.

Inevitably there will be times when sweet reason, politeness and courtesy will get you nowhere. Intractable trolls will chop you up, ceilings will fall in or you will stumble into a darkened pit. Violent death is commonplace in computer adventure. Sometimes you will see it coming some way off, sometimes it will sneak up from behind, sometimes you will seek it out in your recklessness.

Those thoughtful programmers have nevertheless given you the elixir

continued on page 78

continued from page 77

of perpetual life in the form of the Save function. It is, probably, the most useful of all the features built into adventures. If you don't use it already then start now. Loading or saving a prepared position takes a matter of seconds and it is worth doing regularly as you work your way through an adventure.

If trouble is brewing and you have just met a bulbous-eyed spider, or you enter a room where you sense something is wrong — save it. You can return again and again to the danger zone and avoid impending doom by backtracking.

The alternative to saving is to go back to the beginning and even the best games then become unbearably tedious. Don't bother with games which don't offer this facility — they are simply not worth the strain. Saving enables you to keep different versions of each game and allows you to experiment with varying combinations of equipment or routes through the landscape.

At the sign of THE DANCING OGRE



A FEW NIGHTS ago my gate guards, Zul and Zel, woke me long before dawn — never a wise notion. I keep these twin albino halflings at the Ogre *more from sentiment than good sense as they are very weak in both body and head.*

Me, I had been having a heavy night's drinking with a High Priestess of Ithuk and a band of travellers. Despite the effects of the Mountain Gold — a vicious upland liquor — Her Holiness and I were able to put a few of them on the right track.

Several of them had been venturing into the magic mountain of **Ket.** *One Bonecrusher Singleton of Somercotes, Derby had found a large dog near the orc's sleeping place and could see no way to use the beast.*

In my experience animals only need feeding to make them docile and a chain and pillar to tie them up — they will then make excellent treasure guards and will keep rats and orcs at bay. This somewhat singed adventurer also had great trouble with a dragon who lived in the mountain. Pour oil on troubled reptiles, young Bonecrusher!

The great skull which protects the mountain has proved an obstacle to many. Thorne the Slayer from Mansfield cannot pass. Her Holiness told me she had visited this hellish place years ago and the only way to enter was in a priest's clothing, hat, cloak and beard. Thorne also requested other travellers to pass on their knowledge of the infamous **Hulk** *— send me your news by Imperial Post.*

Franklin the Farseer, whose home is in Bromley Cross at Bolton, confessed herself new to this trade and, having collected eight treasures and 9700 points in her attempt to solve the **Inca Curse,** *wondered whether she could go further into the temple.*

I have informants who tell me that she has done well and has reached the maximum. She should now make her way back to where she started. By the way, the skull in the Eagle Room is merely for decoration and serves no other purpose. It cannot be removed.

Another, maid, Spencer the Spy from Birmingham, has travelled to the **Espionage Island,** *a bitter place to search in, overseen as it is by the magicians of Artic. She has found an explosive substance but knows not how it can be used.*

Your trouble is ended, damsel — there is a landing light nearby. Remove the fitting from this lamp and place your explosive inside. Beware — this terrible weapon is detonated by some force called electricity and a switch must be located in a hut.

Ah, the awful dangers you all face out there in the grim world. Spencer has sailed the **Ship of Doom.** *She says that there is a key within a glass box, untouchable to her. In a dark place lie glasses which use infra-red light. Wearing those will help in seeing a battery. If this thing is placed in a rod with a slot it becomes an instrument of vast sonic power and may well release the key from the box if pointed properly.*

Now, naturally, there is wisdom beyond the gates of the Ogre *and those of you who wish help with searching the* **Smugglers' Cove** *or the dread* **Temple of Vran** *should apply to Stephen the Harper of 22 Hillcrest Mews, Retford Nottinghamshire. He claims total success in those quests and awaits the postrider with your letters.*

Congratulations are due to Gareth Evans of Ely, Oliver of Lytham and Andrew Ball of Bristol. All tell me that they have completed their travelling in Middle Earth with Baggins, the **Hobbit.** *Alas Oliver, neither you nor the others are the first to win through in this place, but remember that your score is of prime importance so if others drop by here they should let me know their totals.*

The vast city of London is full of adventurers struggling to attain **Hampstead.** *Slasher Steele of Beaumaris, Gwynedd, cannot enter the merchants' bank and pleaded with me for aid. I relented and told him that he should visit a certain club, beyond the stalls and shops in a long street. If he is properly attired he will be given a passport to great wealth.*

Gregory Timmis cannot make his way to Leatherhead to help **Sherlock** *solve a case. He should make his way to King's Cross where he may find a fire belching conveyance to take him to the town.*

But I digress. The twins woke me suddenly. Outside, barely visible in the weak torchlight was a single rider in fancy southern gear waving a scroll. "A letter from Lord Janga", says he.

"What does he want of me?" shouts I, beset by a ringing headache as I was, "I am in no mood for riddles."

"True," sniggers this foppish oaf, "and you must be cold also, Gordo. Let me in so we can talk.

Over breakfast of boar meat and wine I broke the seal. Come over to the Ogre *next moon and I shall tell you all the drift of this missive from Maru.*

Gordo Greatbelly, landlord

If you have a tale to tell, or are in need of a helping hand, write to the Landlord of the Dancing Ogre c/o Sinclair User, Priory Court, 30-32 Farringdon Lane, London EC1R 5BH.

Driller skillers

David Dodds attacks the use of school micros

JANUARY 11, 1985 was an important date in the educational calendar. It was the day when the Department of Trade offer of half-price computers to primary schools ended.

As an ardent admirer of the Sinclair Spectrum, and as a junior school teacher who believes that the computer has a real contribution to make to good educational practice, I believe the scheme has failed on two counts.

To begin with the offer has inflated the importance of the BBC micro. That has come about because cost-wise it is made to appear an offer that is 'too good to miss'.

The offer has also inflated the price of the Spectrum, for although Sinclair dropped the price of the Spectrum at the outset of the offer, that saving was never passed onto the educational purchaser. Consequently, a school pays more for a Spectrum than it needs.

Originally the Government offer of a computer for every school began with an offer to secondary schools, and it began without the inclusion of the Spectrum. At the same time as the original offer, sans Spectrum, the Government created a 'supportive agency' to be known as the Microelectronics in Education Project — MEP. From the outset that agency has been hard at work producing software for the BBC.

There is nothing wrong with the BBC from the standpoint of its use in a classroom. Indeed, its 'real' typewriter keyboard is a positive advantage. However, the cost of installing it is a different story. The BBC is expensive, even when half-priced. Added to that schools soon found that a disc drive was not a luxury, but essential.

Now comes the crunch. How does a school with 400 children give them the all important, and much trumpeted, hands-on experience?

At our school we have solved that problem by turning to the Spectrum. The economics are simple. To a school the 48K Spectrum is just over £100, microdrive and interface another £80.00 and a black and white portable television £37 — total outlay £217. Thus an entire system can be purchased for the price of a BBC disc drive!

The microcomputer is only as good as its software provision, and unfortunately the provision for the classroom micro has been lamentable. Virginia Makins coined a very apt ephithet when she wrote in the *Times Educational Supplement*:

"Go into any big WH Smiths, and its all too plain that, even if *Driller Killer* has disappeared from the video libraries, Driller Skiller, the educational computer nasty, is prominent on high street shelves."

Indeed they are, and not only in the high street — unfortunately they are also in the MEP catalogue of recommended software, and, most unfortunate of all, they are in the classrooms.

How sad it is. Semour Papert, the originator of **Logo**, and the great proponent of 'children and computers', was saying a decade ago: "In



many schools today, the phrase 'computer-aided instruction' means making the computer teach the child. One might say the computer is being used to program the child. In my vision the child programs the computer."

When the Government scheme was first announced, two years ago, a letter was sent to every primary school from Margaret Thatcher. It makes interesting reading.

". . . I hope this scheme will mean that, by the end of 1984, every primary school has its own microcomputer and will be giving young people the experience they need with the technology of their future working and daily lives . . ."

And all the children have got are Driller Skillers!

In our school we have chosen a different course. What do real computers do? According to Sir Clive they word-process, manage databases, utilise spreadsheets and provide graphics.

He thinks that those applications are so central to the purpose of the computer that he gives them away free with every QL. They sound nice too: Quill, Archive, Abacus, and Easel. We, too, have chosen four areas to develop; we call them, Quill, Archive, Easel, and Lexicon.

Quill is the word-processor. Our seven year olds are introduced to word-processing through **Primary Pen**, from GED Software, a simple but effective program. Further up through school and our nine and ten year olds use **Tasword II**: I never cease to be amazed at how skilfully they use it.

Archive is the database. Projects and topics in the primary school lend themselves to database applications: births at the bird table, houses in the village, parish records, census returns, traffic surveys and so on. We use **Vu-File** because it is a 'creator database' — which is an empty format onto which the children can construct their own fields. That is real computer-aided learning.

Easel is a drawing board. We have found that the most satisfactory way to put high quality maps, plans and illustrations onto the computer screen is to use the Digital Tracer by RD Laboratories.

Lexicon is the word-builder. Word-building for concept development, and word-building for control. For conceptual development we have **Logo**, and what a magnificat program it is. An exact replica of the original Papert Logo, unlike a lot of diluted fakes on the market. **Logo** can allow a child to control an attached turtle, and so learn about the mechanics of special geometry, and it can control an on-screen mock-turtle and so enable the child to 'teach' the computer, and to enter the world of programming in a very positive way.

All that adds up to children becoming computer literate in the real sense: knowledge of how to use the machine, and alert to its potential.

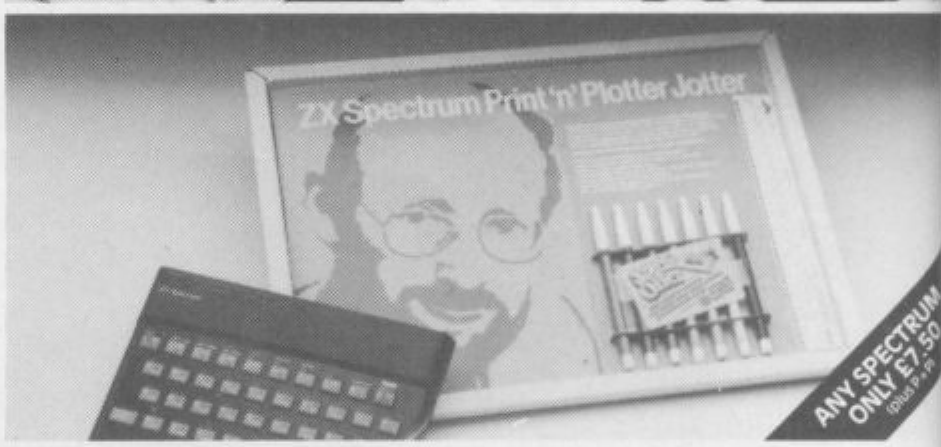
January 11 was the day when computers in the classroom came of age. Now they are on their own.

GED Software, 70 Stoke Road, Bletchley, Milton Keynes, Buckingham NK2 3AD.

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UDG DRAWING BOARD for defining up to 4 Banks of UDG's including ROTATE, MIRROR, INVERSE etc.

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SCREEN PLANNER gives you the best of both worlds! The combined use of PRECISION PLOTTER and your Banks of UDG's for highly detailed and precise screen graphics.

The program is complete with DEMO on side two of the cassette and a 28 page instruction booklet.

PAINTBOX can be used with Joysticks and is Sinclair Microdrive compatible.

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If you have produced a screen-full of superb graphics you can enlarge, reduce, recolour, flip screen, relocate your graphics to another part of the screen, superimpose one screen on another and perform all sorts of other wonders!

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Never has machine code storage of graphics been simpler because SCREEN MACHINE automatically creates re-callable multiple screen files with a location catalogue so that you can add them to your programs!

SCREEN MACHINE also allows the user to program UDG's or text directly into machine code, so if your programs use a lot of text instructions or menus SCREEN MACHINE is going to save fantastic amounts of memory!

SCREEN MACHINE is a major graphics toolkit for the 48K SPECTRUM. It is completely menu-driven, Sinclair Microdrive compatible, and comes with instruction book and an unbelievable DEMO on side 2 of the cassette.

ADVENTURE PLANNER

A must for the adventure game fan

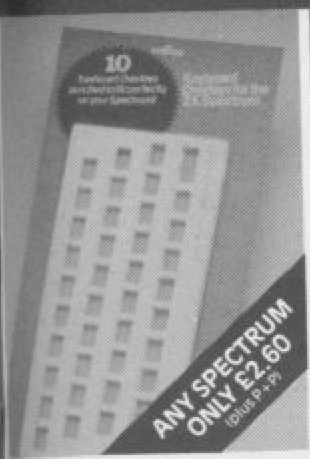
If you're an Adventure Game nut, Print 'n' Plotter's new ADVENTURE PLANNER is exactly what you have been looking for!

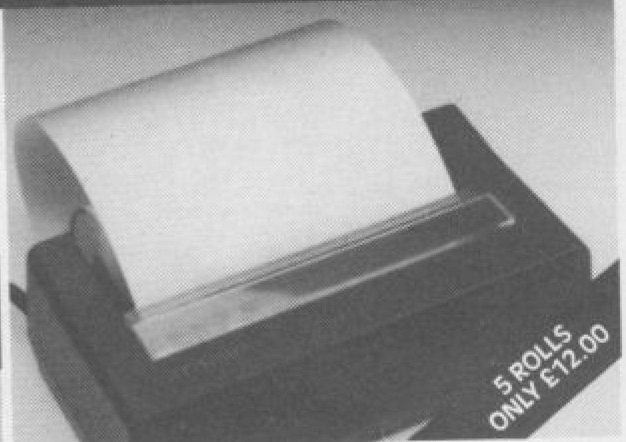
It's a 50 page, BIG SIZE (16¾" x 11¾") pad with a complete 'mapping' system with over 150 locations on each sheet . . . created to help you solve Adventure Games.

It's the best way to beat the 'system' and is obviously for use with any make of computer.

ADVENTURE PLANNER will also assist you in planning Adventure Games for programming — a helpful pad to keep by your computer at all times.

IMPROVE PROGRAMS.







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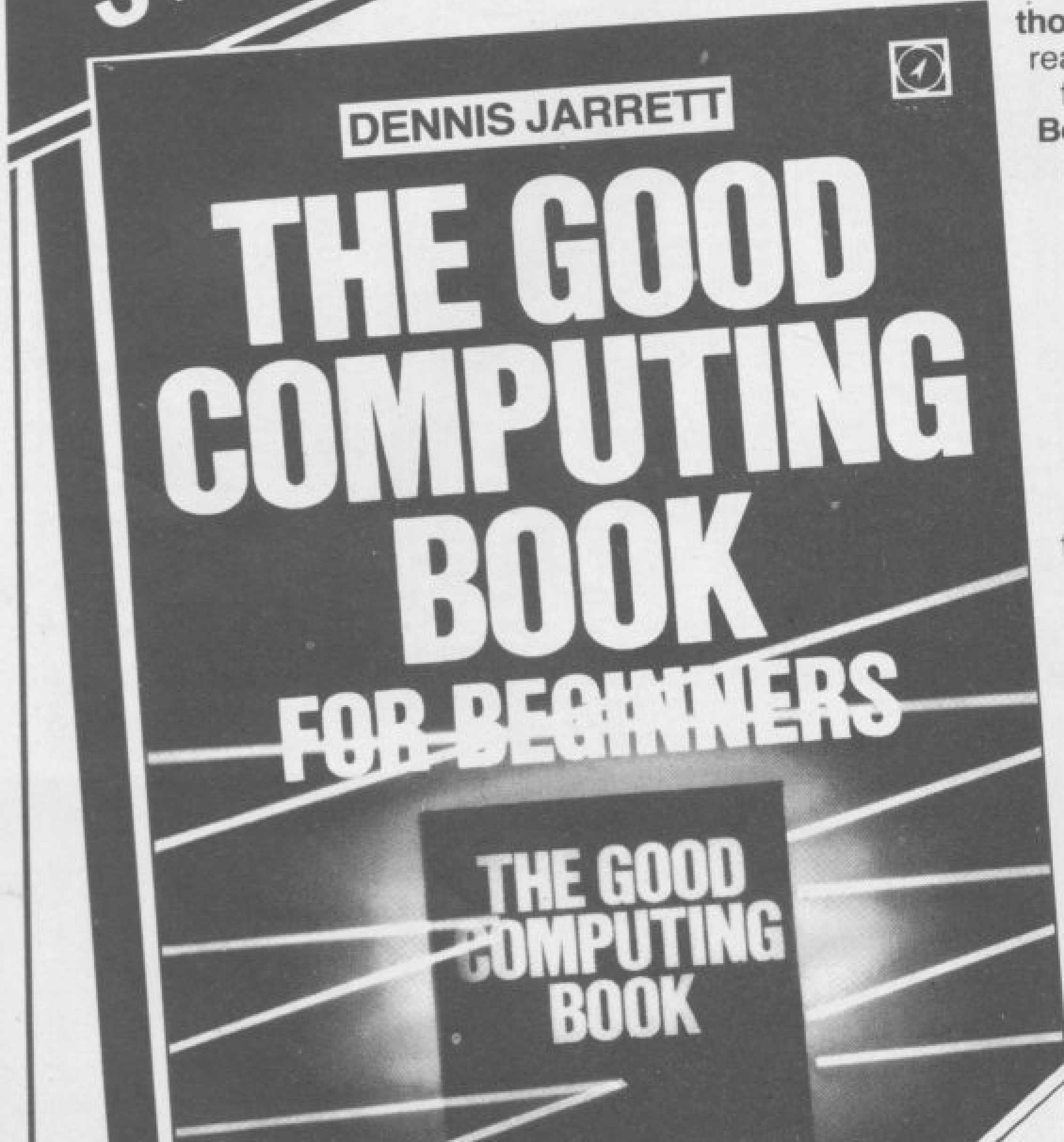
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PROGRAM PRINTOUT

WHITE CITY

GRAPHICS INSTRUCTIONS

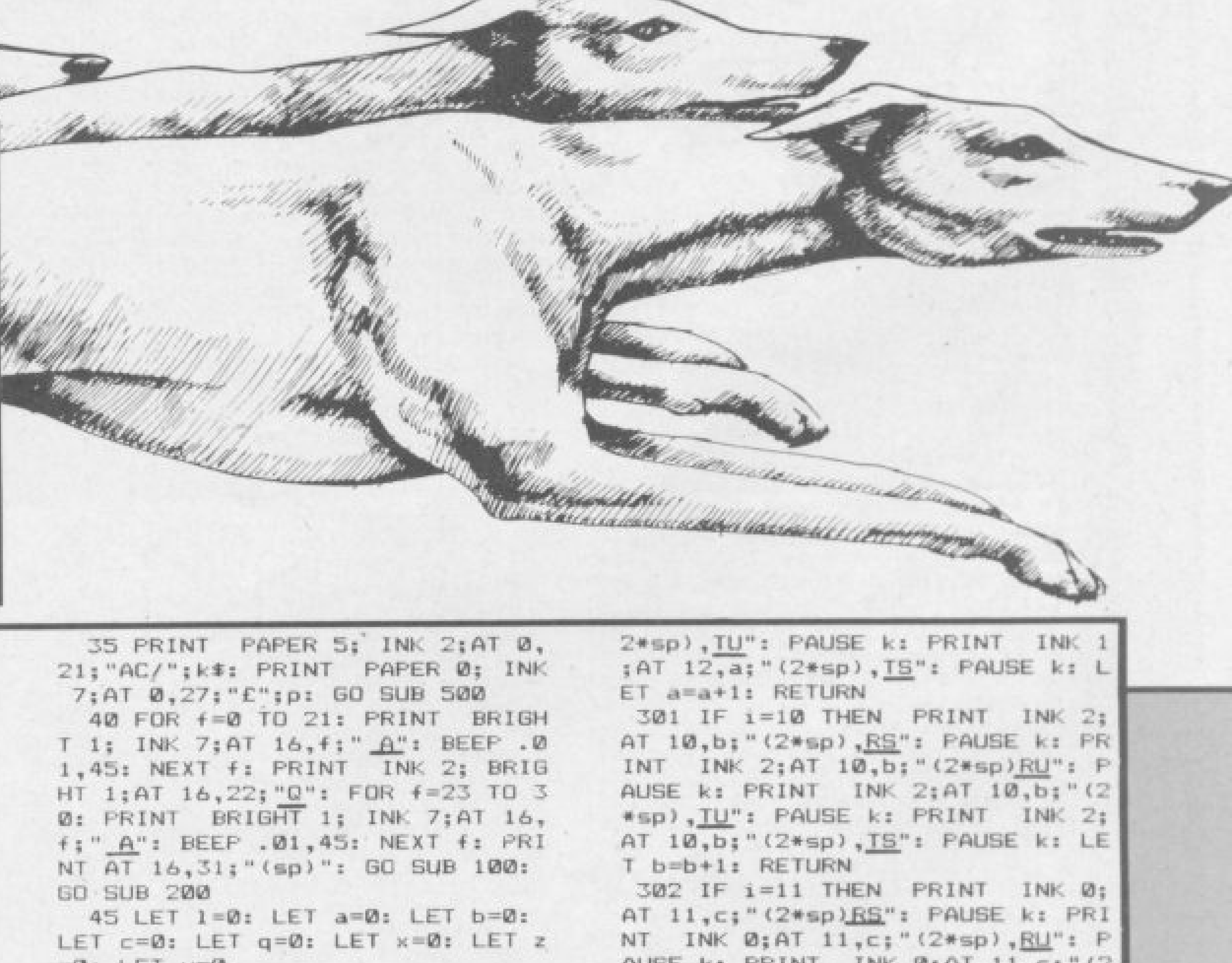
Instructions for graphics characters are printed in lower-case letters in our listings. They are enclosed by brackets and separated by colons to distinguish them and the brackets and colons should not be entered.

Inverse characters are represented by the letter "i" and graphics characters by "g". Thus an inverse W would be represented by "iw", a graphics W by "gw", and an inverse graphics W by "igw".

Spaces are represented by "sp" and inverse spaces by "isp". Whenever any character is to be used more than once, the number of times it is to be used is shown before it, together with a multiplication sign. Thus "6*isp" means six inverse spaces and "(g4:4*i4:g3)" would be entered as a graphic four, followed by an inverse four repeated four times, followed by a graphics three. Control codes appear with cc before the appropriate key. They are obtained by pressing Caps Shift while in Extended mode.

Where whole words are to be written in inverse letters they appear in the listings as lower-case letters. Letters to be entered in graphics mode on the Spectrum are underlined.

Inverse characters may be entered on the ZX-81 by changing to graphics mode and then typing the appropriate characters and on the Spectrum by changing to inverse video and typing the appropriate letters. Graphics characters may be entered on the ZX-81 by changing to graphics mode and then pressing symbol shift while the appropriate characters are entered. On the Spectrum graphics characters may be obtained by changing to graphics mode and then pressing the appropriate character. User-defined graphics will appear as normal letters until the program has been RUN.



THE HARE stands by the traps in which the greyhounds peer with gleaming eyes down the floodlit track.

Make your bet and take your chance in this 16K game for the Spectrum by N M Gardner of Poole in Dorset.

The listing uses graphics notation. The instructions for the use of those symbols can be found in the box at the top of this page.

```
  1 POKE 23658,8: BRIGHT 1: BOR
DER 4: PAPER 4: INK 9: CLS
  2 LET p=100: LET w=1: LET nm=
23: LET k=4
  5 INPUT "Enter your name as 3
 initials   ";k$
  7 LET o=LEN k$
  8 IF o<3 OR o>3 THEN  GO TO 5
  9 IF o=3 THEN  GO TO 4000
 19 GO TO 5
 20 REM DEFINE GRAPHICS
 22 FOR f=0 TO 7: READ a: POKE
USR "A"+f,a: NEXT f: DIM n(7)
 23 FOR f=0 TO 7: READ a: POKE
USR "R"+f,a: NEXT f
 24 FOR f=0 TO 7: READ a: POKE
USR "S"+f,a: NEXT f
 25 FOR f=0 TO 7: READ a: POKE
USR "T"+f,a: NEXT f
 26 FOR f=0 TO 7: READ a: POKE
USR "U"+f,a: NEXT f
 27 FOR f=0 TO 7: READ a: POKE
USR "Q"+f,a: NEXT f
 28 FOR f=0 TO 7: READ a: POKE
USR "P"+f,a: NEXT f
 29 REM PRINT GAME
 30 FOR s=26 TO 33 STEP 1: FOR
g=0 TO 1: PRINT  INK 6;AT 9+g*8,
0;"(2*ig3,ig7,ig3,ig3,ig7,2*ig3,
ig7,2*ig3,ig7,2*ig3,ig7,2*ig3,ig
7,2*ig3,ig7,2*ig3,ig7,2*ig3,ig7,
2*ig3,ig7,2*ig3)": NEXT g
 31 LET l=2: FOR f=8+1 TO 13+1
STEP 1: PRINT  INK 1;AT f,0;"(3*
isp)": LET l=l+1: NEXT f
 32 PRINT  INK 0;AT 11,0;"(3*is
p)": PRINT  INK 1;AT 12,0;"(3*is
p)"
 35 PRINT  PAPER 5; INK 2;AT 0,
21;"AC/";k$: PRINT  PAPER 0; INK
 7;AT 0,27;"£";p: GO SUB 500
 40 FOR f=0 TO 21: PRINT  BRIGH
T 1; INK 7;AT 16,f;" A": BEEP .0
1,45: NEXT f: PRINT  INK 2; BRIG
HT 1;AT 16,22;"Q": FOR f=23 TO 3
0: PRINT  BRIGHT 1; INK 7;AT 16,
f;" A": BEEP .01,45: NEXT f: PRI
NT AT 16,31;"(sp)": GO SUB 100:
GO SUB 200
 45 LET l=0: LET a=0: LET b=0:
LET c=0: LET q=0: LET x=0: LET z
=0: LET y=0
 47 RANDOMIZE
 48 REM DOG RACE
 54 LET i=INT (RND*7)+9: GO SUB
 300
 55 IF a=20 OR b=20 OR c=20 OR
q=20 OR x=20 OR z=20 THEN  GO SU
B 600+1
 99 GO TO 54
100 FOR u=3 TO 0 STEP -1: FOR t
=15 TO 10 STEP -1: PRINT AT t,u;
"(sp)": NEXT t: NEXT u: PRINT  B
RIGHT 1; INK 2;AT 16,22;"Q": PRI
NT  INK 0;AT 17,22;"P"
109 RETURN
200 PRINT  INK 2;AT 10,0;"TS":
PRINT  INK 0;AT 11,0;"TS": PRINT
  INK 1;AT 12,0;"TS": PRINT  INK
 5;AT 13,0;"TS": PRINT  INK 6;AT
 14,0;"TS": PRINT  INK 7;AT 15,0
;"TS": RETURN
300 IF i=12 THEN  PRINT  INK 1;
AT 12,a;"(2*sp),RS": PAUSE k: PR
INT  INK 1;AT 12,a;"(2*sp),RS":
PAUSE k: PRINT  INK 1;AT 12,a;"(
2*sp),TU": PAUSE k: PRINT  INK 1
;AT 12,a;"(2*sp),TS": PAUSE k: L
ET a=a+1: RETURN
301 IF i=10 THEN  PRINT  INK 2;
AT 10,b;"(2*sp),RS": PAUSE k: PR
INT  INK 2;AT 10,b;"(2*sp)RU": P
AUSE k: PRINT  INK 2;AT 10,b;"(2
*sp),TU": PAUSE k: PRINT  INK 2;
AT 10,b;"(2*sp),TS": PAUSE k: LE
T b=b+1: RETURN
302 IF i=11 THEN  PRINT  INK 0;
AT 11,c;"(2*sp)RS": PAUSE k: PRI
NT  INK 0;AT 11,c;"(2*sp),RU": P
AUSE k: PRINT  INK 0;AT 11,c;"(2
*sp),TU": PAUSE k: PRINT  INK 0;
AT 11,c;"(2*sp),TS": PAUSE k: LE
T c=c+1: RETURN
303 IF i=13 THEN  PRINT  INK 5;
AT 13,q;"(2*sp),RS": PAUSE k: PR
INT  INK 5;AT 13,q;"(2*sp)RU": P
AUSE k: PRINT  INK 5;AT 13,q;"(2
*sp),TU": PAUSE k: PRINT  INK 5;
AT 13,q;"(2*sp),TS": PAUSE k: LE
T q=q+1: RETURN
304 IF i=14 THEN  PRINT  INK 6;
AT 14,x;"(2*sp),RS": PAUSE k: PR
INT  INK 6;AT 14,x;"(2*sp),RU":
PAUSE k: PRINT  INK 6;AT 14,x;"(
2*sp),TU": PAUSE k: PRINT  INK 6
;AT 14,x;"(2*sp),TS": PAUSE k: L
ET x=x+1: RETURN
305 IF i=15 THEN  PRINT  INK 7;
AT 15,z;"(2*sp),RS": PAUSE k: PR
INT  INK 7;AT 15,z;"(2*sp),RU":
PAUSE k: PRINT  INK 7;AT 15,z;"(
2*sp),TU": PAUSE k: PRINT  INK 7
```

continued on page 86



continued from page 85

```
;AT 15,z;"(2*sp),TS": PAUSE k: L
ET z=z+1: RETURN
 308 RETURN
 500 PRINT  INK 1;AT 0,4;"(17*is
p)": FOR f=1 TO 7: PRINT  INK 1;
AT f,4;"(isp),(15*sp),(isp)": NE
XT f: PRINT  INK 1;AT 8,4;"(17*i
g3)"
 501 PRINT  INK 2; BRIGHT 1;AT 1
6,22;"O": PRINT  INK 0;AT 17,22;
"P"
 502 LET i=0
 503 PRINT  INK 2; INVERSE 1; PA
PER 7;AT 8,23;"^^FORM^^"
 505 FOR f=1 TO 7: PRINT  INK 0;
AT f,5;"(15*isp)": NEXT f
 509 LET t$="WHITE CITY.....": L
ET h=1
 510 LET g=1: FOR f=2 TO 7 STEP
1: PRINT  PAPER f; INK 9;AT f,5;
"T";g: LET g=g+1: NEXT f: PRINT
 PAPER 0;AT 3,5;"T2": PRINT  PAP
ER 1;AT 4,5;"T3"
 511 FOR f=2 TO 7 STEP 1: LET n(
f)=INT (RND*7)+3: PRINT  PAPER 5
;AT f,14;n(f);: PRINT  PAPER 5;"
/1": NEXT f
 518 FOR f=2 TO 7 STEP 1: PRINT
 PAPER f;AT f,21;h;: PRINT "=";:
 PRINT  PAPER 7; INK 3; INVERSE
1;AT f,nm;"0": LET h=h+1: NEXT f
 519 PRINT  PAPER 0;AT 3,21;"2":
 PRINT  PAPER 1;AT 4,21;"3"
 520 PRINT  BRIGHT 1; INVERSE 1;
 PAPER 0; INK 6;AT 1,5;t$( TO 15
)
 521 LET i=i+1
 522 BEEP .008,RND*5
 525 LET t$=t$(2 TO )+t$(1)
 526 PAUSE 8
 527 IF i=31 THEN  GO TO 532
 528 PRINT AT 18,10;"RACE NO:";w
 530 GO TO 520
 532 PRINT  FLASH 1; PAPER 0; IN
K 6;AT 20,1;"SELECT TRAP....THEN
 PLACE BET.": PAUSE 0
 536 PRINT AT 20,1;"(32*sp)"

 537 REM TRAP SELECTION
 540 IF INKEY$="1" THEN  PRINT
PAPER 2;AT 2,5;"T1": LET e=2: PR
INT  PAPER 7;AT e,7;"*": GO TO 5
50
 541 IF INKEY$="2" THEN  PRINT
PAPER 0;AT 3,5;"T2": LET e=3: PR
INT  PAPER 7;AT e,7;"*": GO TO 5
50
 542 IF INKEY$="3" THEN  PRINT
PAPER 1;AT 4,5;"T3": LET e=4: PR
INT  PAPER 7;AT e,7;"*": GO TO 5
50
 543 IF INKEY$="4" THEN  PRINT
PAPER 5;AT 5,5;"T4": LET e=5: PR
INT  PAPER 7;AT e,7;"*": GO TO 5
50
 544 IF INKEY$="5" THEN  PRINT
PAPER 6;AT 6,5;"T5": LET e=6: PR
INT  PAPER 7;AT e,7;"*": GO TO 5
50
 545 IF INKEY$="6" THEN  PRINT
PAPER 7;AT 7,5;"T6": LET e=7: PR
INT  PAPER 7;AT e,7;"*": GO TO 5
50
 547 GO TO 540
 550 INPUT  PAPER 7; INVERSE 1;
INK 2;"BET £";m
 552 IF m>p THEN  GO TO 550
 555 PRINT  PAPER 7; INK 3;AT e,
9;"£";m
 560 PRINT AT 0,28;"(5*sp)": PRI
NT  INK 7; PAPER 0;AT 0,28;p-m:
GO TO 599
 599 RETURN
 600 IF a=20 THEN  PRINT  INK 0;
AT 4,3;"1": LET a=21: PRINT  PAP
ER 7; INVERSE 1;AT 4,nm;"1"
 601 IF b=20 THEN  PRINT  INK 0;
AT 2,3;"1": LET b=21: PRINT  PAP
ER 7; INVERSE 1;AT 2,nm;"1"
 602 IF c=20 THEN  PRINT  INK 0;
AT 3,3;"1": LET c=21: PRINT  PAP
ER 7; INVERSE 1;AT 3,nm;"1"
 603 IF q=20 THEN  PRINT  INK 0;
AT 5,3;"1": LET q=21: PRINT  PAP
ER 7; INVERSE 1;AT 5,nm;"1"
 604 IF x=20 THEN  PRINT  INK 0;
AT 6,3;"1": LET x=21: PRINT  PAP
ER 7; INVERSE 1;AT 6,nm;"1"
 605 IF z=20 THEN  PRINT  INK 0;
AT 7,3;"1": LET z=21: PRINT  PAP
ER 7; INVERSE 1;AT 7,nm;"1"
 608 LET l=50
 610 RETURN
 650 IF a=20 THEN  PRINT  INK 0;
AT 4,3;"2": PRINT  PAPER 2; INVE
RSE 1;AT 4,nm;"2"
 651 IF b=20 THEN  PRINT  INK 0;
AT 2,3;"2": PRINT  PAPER 2; INVE
RSE 1;AT 2,nm;"2"
 652 IF c=20 THEN  PRINT  INK 0;
AT 3,3;"2": PRINT  PAPER 2; INVE
RSE 1;AT 3,nm;"2"
 653 IF q=20 THEN  PRINT  INK 0;
AT 5,3;"2": PRINT  PAPER 2; INVE
RSE 1;AT 5,nm;"2"
 654 IF x=20 THEN  PRINT  INK 0;
AT 6,3;"2": PRINT  PAPER 2; INVE
RSE 1;AT 6,nm;"2"
 655 IF z=20 THEN  PRINT  INK 0;
AT 7,3;"2": PRINT  PAPER 2; INVE
RSE 1;AT 7,nm;"2"
 660 PRINT  FLASH 1; PAPER 0; IN
K 5;AT 2,1;"R";AT 3,1;"E";AT 4,1
;"S";AT 5,1;"U";AT 6,1;"L";AT 7,
1;"T"
 679 LET w=w+1
 680 IF b>=21 THEN  IF SCREEN$ (
2,9)=CHR$ 96 THEN  PRINT  INVERS
E 1;AT 19,8;"RETURN £";m*n(2)+m:
 LET p=p+(m*n(2)): PAUSE 120: PR
INT AT 19,8;"(12*sp)": GO TO 800
 681 IF c>=21 THEN  IF SCREEN$ (
3,9)=CHR$ 96 THEN  PRINT  INVERS
E 1;AT 19,8;"RETURN £";m*n(3)+m:
 LET p=p+(m*n(3)): PAUSE 120: PR
INT AT 19,8;"(12*sp)": GO TO 800
 682 IF a>=21 THEN  IF SCREEN$ (
4,9)=CHR$ 96 THEN  PRINT  INVERS
E 1;AT 19,8;"RETURN £";m*n(4)+m:
 LET p=p+(m*n(4)): PAUSE 120: PR
INT AT 19,8;"(12*sp)": GO TO 800
 683 IF q>=21 THEN  IF SCREEN$ (
5,9)=CHR$ 96 THEN  PRINT  INVERS
E 1;AT 19,8;"RETURN £";m*n(5)+m:
 LET p=p+(m*n(5)): PAUSE 120: PR
INT AT 19,8;"(12*sp)": GO TO 800
 684 IF x>=21 THEN  IF SCREEN$ (
6,9)=CHR$ 96 THEN  PRINT  INVERS
E 1;AT 19,8;"RETURN £";m*n(6)+m:
 LET p=p+(m*n(6)): PAUSE 120: PR
INT AT 19,8;"(12*sp)": GO TO 800
 685 IF z>=21 THEN  IF SCREEN$ (
7,9)=CHR$ 96 THEN  PRINT  INVERS
E 1;AT 19,8;"RETURN £";m*n(7)+m:
 LET p=p+(m*n(7)): PAUSE 120: PR
INT AT 19,8;"(12*sp)": GO TO 800
 690 LET p=p-m: PRINT  PAPER 0;
INK 7;AT 0,28;p
 693 IF p=1000 THEN  GO TO 3000
 695 IF p<=0 THEN  BEEP 1,0: GO
TO 2000
 800 PAUSE 300: FOR j=0 TO 7: PR
INT AT j,0;"(4*sp)": NEXT j: FOR
 f=10 TO 16 STEP 1: PRINT AT f,0
;"(32*sp)": NEXT f
 805>PRINT AT 19,14;"(4*sp)":PRI
NT AT 18,0;"(4*sp)"
 810 LET nm=nm+1
 900 NEXT s
1000 DATA 4,7,30,49,0,0,0,0
1010 DATA 192,48,15,7,59,64,128,
0
1020 DATA 12,30,240,224,220,2,1,
0
1030 DATA 32,32,63,7,11,8,8,6
1040 DATA 12,30,240,224,208,16,1
6,96
1050 DATA 0,60,126,102,102,126,6
0,24
1060 DATA 24,24,24,24,24,24,24,2
4
2000 CLS : BORDER 1: PAPER 1: IN
K 9: PRINT AT 11,5;"BETTER LUCK
NEXT TIME": RESTORE
2010 PRINT AT 13,7;"ANOTHER GAME
(Y/N)?"
2020 IF INKEY$="Y" THEN  CLS : G
O TO 1
2030 IF INKEY$="N" THEN  CLS : P
RINT AT 11,12;"GOODBYE"
2040 GO TO 2020
3000 BORDER 0: PAPER 0: INK 5: C
LS : PRINT  FLASH 1;AT 10,0;"  C
ONGRATULATIONS!! YOU ARE THE   P
ROUD OWNER OF A GREYHOUND.": FOR
 G=0 TO 15: BEEP .008,G: NEXT G
3010 PRINT  INK 2;AT 14,0;"TUTUT
UTUTUTUTUTUTUTUTUTUTUTUTUTU"
3020 PAUSE 0
3025 PRINT AT 16,7;"PRESS ANY KE
Y"
3027 RESTORE
3030 GO TO 1
4000 BORDER 6: PAPER 6: INK 9: C
LS
4010 PRINT AT 2,2;k$;" is your a
.c. which starts  at";
4015 PRINT " £100. You have to a
ccumulate"
4020 PRINT "£1000 or more to you
r account    to buy a Greyhound.
"
4025 PRINT '"If after 8 races yo
ur account       stands";
4030 PRINT " at £999 or less the
n   your racing knowledge"
4035 PRINT " is not up to scratc
h."
4040 PRINT ''"Let somebody else
have a try...."
4045 PRINT  INVERSE 1;AT 18,6;"P
ress 'C' to start"
4050 IF INKEY$="C" THEN  GO TO 4
060
4055 GO TO 4050
4060 BORDER 4: PAPER 4: CLS : GO
 TO 22
```

LOVE is...



LONELY hearts with an empty letterbox on February 14 might care to try the *Sinclair User* dating agency as a means to obtaining their ideal partner in life. The program deals with physical characteristics, professions, and interests, but you could modify it to include other items if you wanted. It also requires information about your ideal partner.

Love Is . . . was written by the romantic Jonathan Ashburner of St Helens on Merseyside, for the 48K Spectrum. The computer requests personal details and then matches them against other stored in the computer. You may save the data to tape and also take a hard copy of the questionnaire and details of the match if you have a printer.

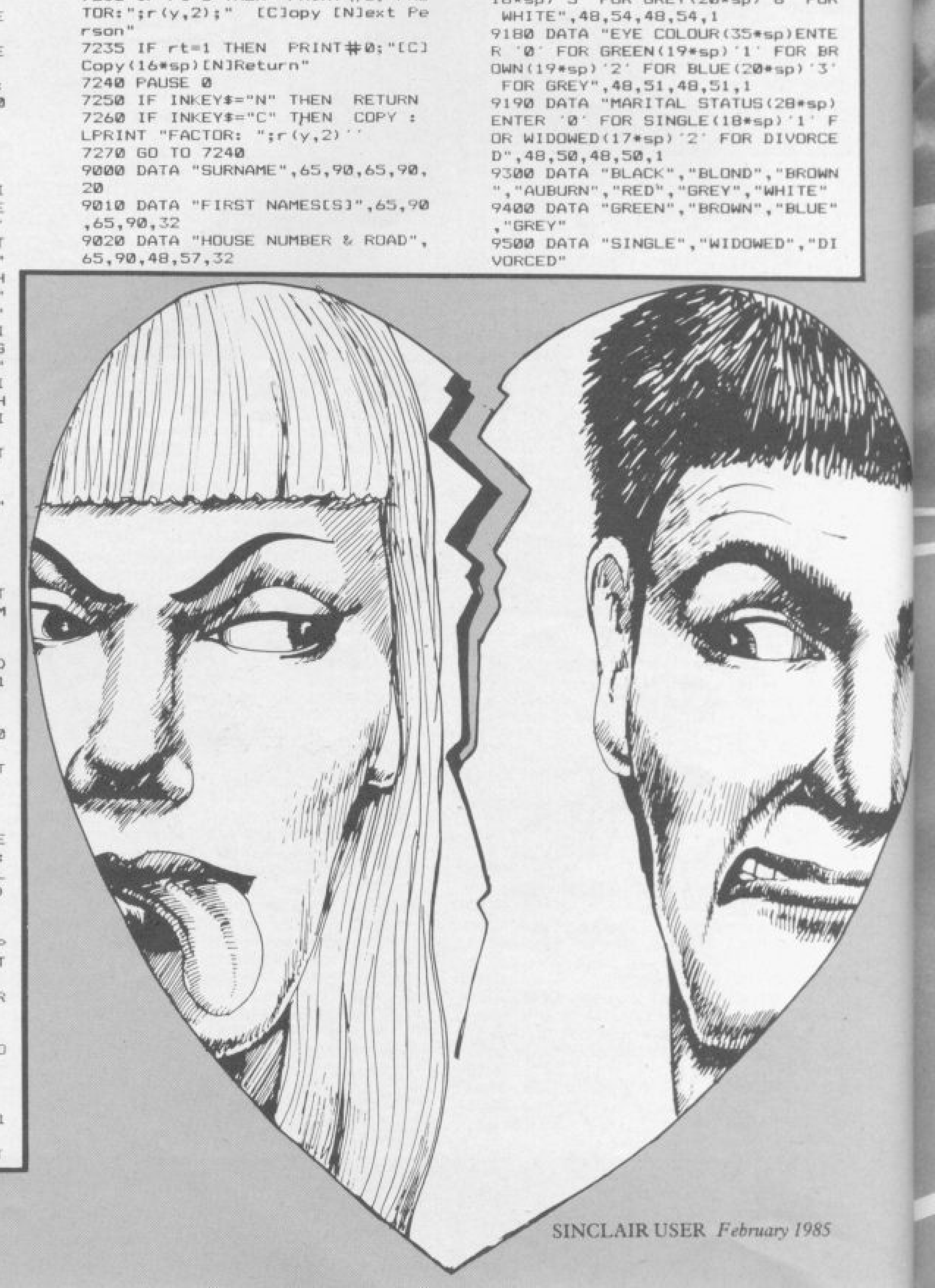
The program uses our special abbreviations for graphics characters, so please read the instructions on the first page of Program Printout before typing in the program.

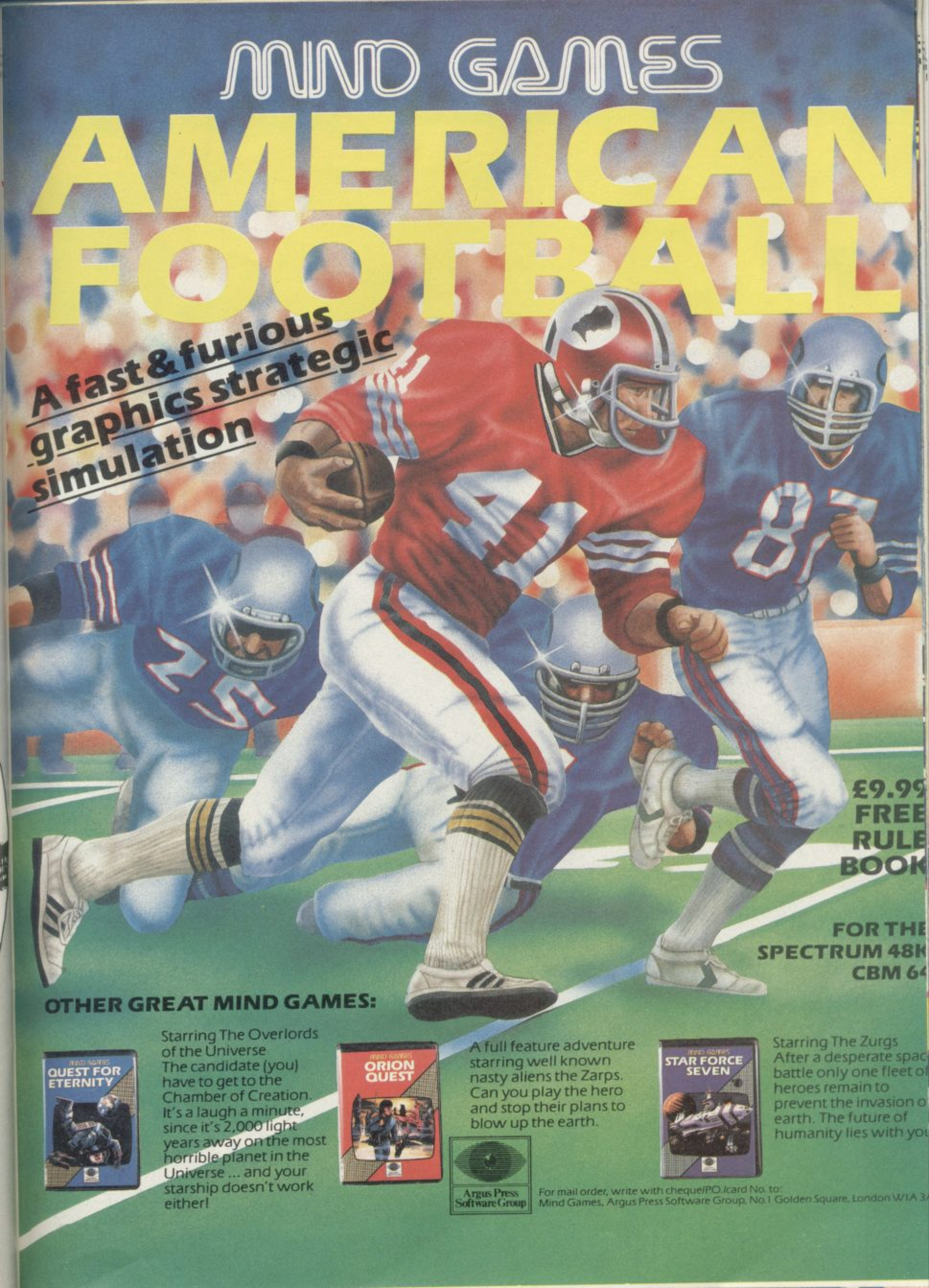
```
  10 LET f1=40: LET e$="---------
---------------------------"
  20 BORDER 0: PAPER 0: INK 7: B
RIGHT 1
  30 DIM p(f1): DIM n$(f1,20): D
IM m$(f1,32): DIM a$(f1,32): DIM
 c$(f1,20): DIM d$(f1,20): DIM p
$(f1,10): DIM a(f1,2): DIM s(f1)
: DIM t$(f1,20): DIM o$(f1,2,32)
: DIM i$(f1,4,2,32): DIM z$(f1,2
,32): DIM l(f1,2): DIM w(f1,2):
DIM h(f1,2): DIM e(f1,2): DIM m(
f1,2)
 100 LET b=4
1000 POKE 23658,8: CLS : PRINT A
T 0,0;"ROSALINE - DATING PROGRAM
": PLOT 0,166: DRAW 200,0
1010 PRINT  INK 3;AT 4,0;" INPUT
"''" ERASE"''" MATCH"''" PRINTOU
T QUESTIONAIRRE"''" SAVE LATEST
FILES"''" VIEW PERSONNEL DATA"
1020 PRINT AT 19,0;"~L~ SELECT"'
'"~ENTER~ EXECUTE OPTION"
1100 PRINT AT b,1; OVER 1; INK 7
;"(32*sp)"
1110 PAUSE 0: LET w$=INKEY$
1120 IF w$<>"L" AND w$<>CHR$ 13
THEN  GO TO 1110
1130 IF w$=CHR$ 13 THEN  CLS : G
O TO ((b/4)*1000)+1000
1140 PRINT AT b,1; OVER 1; INK 3
;"(32*sp)": LET b=b+2: IF b=16 T
HEN  LET b=4
1150 GO TO 1100
2000 FOR n=1 TO f1: IF p(n)=0 TH
EN  LET f=n: GO TO 2010
2005 NEXT n: PRINT "OUT OF MEMOR
Y": FOR n=1 TO 200: NEXT n: GO T
O 1000
2010 DIM x$(20,2,32): LET ar=1:
RESTORE 9000
2020 FOR n=1 TO 20: GO SUB 2030:
 NEXT n: GO TO 2250
2030 READ h$,lo,hi,lo1,hi1,len
2040 PRINT "PLEASE ENTER"''h$;AT
 18,0;e$( TO len);AT 20,0;e$( TO
 len)
2050 LET ps=0: LET ps1=0: LET le
n=len-1
2060 PRINT AT 19,ps1; OVER 1; FL
ASH 0;"(sp)";AT 19,ps; FLASH 1;"
(sp)"
2070 PAUSE 0: LET h$=CHR$ PEEK 2
3560
2075 IF h$=" STOP " THEN  GO TO
1000
2080 IF h$="(sp)" OR (CODE h$>=l
o AND CODE h$<=hi) OR (CODE h$>=
lo1 AND CODE h$<=hi1) THEN  PRIN
T AT 19,ps;h$: LET x$(n,ar,ps+1)
=h$: LET ps1=ps: LET ps=ps+1: IF
 ps>len THEN  GO TO 2200
2090 IF h$="(sp)" OR (CODE h$>=l
o AND CODE h$<=hi) OR (CODE h$>=
lo1 AND CODE h$<=hi1) THEN  GO T
O 2060
2100 IF h$=CHR$ 13 AND len<8 AND
 x$(n,ar,1 TO 2)="(2*sp)" THEN
GO TO 2070
2105 IF h$=CHR$ 13 THEN  CLS : R
ETURN
2110 IF h$=CHR$ 12 AND ps>0 THEN
  LET ps1=ps: LET ps=ps-1: LET x
$(n,ar,ps+1)="(sp)": PRINT AT 19
,ps;"(sp)": GO TO 2060
2120 IF h$=CHR$ 8 AND ps>0 THEN
 LET ps1=ps: LET ps=ps-1
2130 IF h$=CHR$ 9 THEN  LET ps1=
ps: LET ps=ps+1
2140 IF ps>len THEN  GO TO 2200
2150 GO TO 2060
2200 PRINT AT 19,len; OVER 1;"(s
p)": PAUSE 0: LET h$=CHR$ PEEK 2
3560: IF CODE h$=12 OR CODE h$=1
3 OR CODE h$=8 OR CODE h$=9 THEN
  GO TO 2100
2210 GO TO 2200
2250 LET ar=2: PRINT "PLEASE ENT
ER INFORMATION ABOUT  PARTNER":
FOR n=1 TO 200: NEXT n: CLS
2260 LET n=7: RESTORE 9060: GO S
UB 2030
2270 RESTORE 9090: FOR n=10 TO 2
0: GO SUB 2030: NEXT n
2300 LET n$(f)=x$(1,1): LET m$(f
)=x$(2,1)
2310 LET a$(f)=x$(3,1): LET c$(f
)=x$(4,1): LET d$(f)=x$(5,1): LE
T p$(f)=x$(6,1)
2320 LET a(f,1)=VAL x$(7,1): LET
 s(f)=VAL x$(8,1)
2330 LET t$(f)=x$(9,1): LET o$(f
,1)=x$(10,1)
2340 FOR n=1 TO 4: LET i$(f,n,1)
=x$(n+10,1): LET i$(f,n,2)=x$(n+
10,2): NEXT n
2350 LET z$(f,1)=x$(15,1)
2360 LET l(f,1)=VAL x$(16,1): LE
T w(f,1)=VAL x$(17,1): LET h(f,1
)=VAL x$(18,1): LET e(f,1)=VAL x
$(19,1): LET m(f,1)=VAL x$(20,1)
2370 LET a(f,2)=VAL x$(7,2)
2380 LET z$(f,2)=x$(15,2)
2390 LET l(f,2)=VAL x$(16,2): LE
T w(f,2)=VAL x$(17,2): LET h(f,2
)=VAL x$(18,2): LET e(f,2)=VAL x
$(19,2): LET m(f,2)=VAL x$(20,2)
2400 LET p(f)=1: GO TO 1000
2500 INPUT AT 22,0;AT 0,0;"WHAT
IS SURNAME OF PERSON TO    ERASE
"'' LINE h$'''"WHAT ARE FIRST NA
MES OF PERSON  TO BE ERASED"'' L
INE j$
2510 FOR n=1 TO f1
2520 IF n$(n,1 TO LEN h$)=h$ AND
 m$(n,1 TO LEN j$)=j$ AND p(n)=1
 THEN  GO TO 2530
2525 NEXT n: PRINT "NOT FOUND":
FOR n=1 TO 200: NEXT n: GO TO 10
00
2530 PRINT "FOUND"''n$(n)'m$(n)'
''"PRESS 'E' to ERASE"'"(6*sp)'A
' to ABANDON": PAUSE 0: IF INKEY
$="A" THEN  GO TO 1000
2535 LET p(n)=0
2540 GO TO 1000
3000 INPUT AT 22,0;AT 0,0;"SURNA
ME"'' LINE h$'''"FIRST NAMES"''
LINE j$
3005 DIM r(f1,2)
3010 FOR n=1 TO f1
3020 IF n$(n,1 TO LEN h$)=h$ AND
 m$(n,1 TO LEN j$)=j$ AND p(n)=1
  THEN  GO TO 3035
```

continued on page 88

continued from page 87

```
3030 NEXT n: PRINT "NOT FOUND":
FOR n=1 TO 200: NEXT n: GO TO 10
00
3035 INPUT AT 22,0;AT 0,0;"DO YO
U WANT MEMBER OF THE(7*sp)OPPOSI
TE SEX ONLY ? "; LINE h$
3040 PRINT "FOUND"''n$(n)'m$(n)'
'' FLASH 1;" MATCHING ": LET f=n
3050 FOR n=1 TO fl
3060 IF p(n)=0 OR n=f OR (s(n)=s
(f) AND h$(1)="Y") THEN  NEXT n:
 GO TO 7000
3070 LET ma=1: LET ma1=2: LET t=
0
3080 IF a(f,ma)=a(n,ma1) THEN  L
ET t=t+10
3082 LET df=ABS (a(f,ma)-a(n,ma1
)): IF df<2 THEN  LET t=t+10
3084 LET df=ABS (a(f,ma)-a(n,ma1
)): IF df<5 THEN  LET t=t+10
3090 IF o$(f,ma)=o$(n,ma1) THEN
 LET t=t+20
3100 FOR x=1 TO 4: FOR y=1 TO 4:
 IF i$(f,x,ma)=i$(n,y,ma1) THEN
 LET t=t+10
3110 NEXT y: NEXT x
3120 IF z$(f,ma)=z$(n,ma1) THEN
 LET t=t+1
3130 IF ma=1 AND s(n)=0 AND l(f,
ma)>l(n,ma1) THEN  LET t=t+2
3140 IF ma=1 AND s(n)=1 AND l(f,
ma)<l(n,ma1) THEN  LET t=t+2
3150 IF h(f,ma)=h(n,ma) THEN  LE
T t=t+1
3160 IF m(f,ma)=m(n,ma) THEN  LE
T t=t+1
3170 IF ma=2 THEN  LET r(n,1)=n:
 LET r(n,2)=t: NEXT n: GO TO 700
0
3180 LET ma=2: LET ma1=1: GO TO
3080
3500 PRINT "PRINTING"
3510 LPRINT "COMPUTER QUESTIONAI
RRE"'"PLEASE USE BIRO"''"SURNAME
:"'"FIRST NAMES:"'"ADDRESS:"''''
"AGE:"'"SEX:"'"TEL NO:"'"OCCUPAT
ION:"'"INTERESTS-"'"1ST:"'"2ND:"
'"3RD:"'"4TH:"'"NATIONALITY:"'"H
EIGHT:"'"WEIGHT:"'"HAIR COLOUR:"
'"EYE COLOUR:"'"MARITAL STATUS:"
3520 LPRINT ''"WHAT WOULD YOU WI
SH YOUR PARTNERTO BE LIKE?"''"AG
E:"'"OCCUPATION:"'"INTERESTS-"'"
1ST:"'"2ND:"'"3RD:"'"4TH:"'"NATI
ONALITY:"'"HEIGHT:"'"WEIGHT:"'"H
AIR COLOUR:"'"EYE COLOUR:"'"MARI
TAL STATUS:"
3530 FOR n=1 TO 4: LPRINT : NEXT
 n
3540 GO TO 1000
4000 PRINT "PRESS 'S' to SAVE"'"
      'A' to ABANDON": PAUSE 0:
IF INKEY$="A" THEN  GO TO 1000
4005 SAVE "ROSALINE" LINE 100
4010 GO TO 1000
4500 INPUT AT 22,0;AT 0,0;"INPUT
 SURNAME"'' LINE h$'''"FIRST NAM
ES"'' LINE j$
4510 FOR n=1 TO fl
4520 IF n$(n,1 TO LEN h$)=h$ AND
 m$(n,1 TO LEN j$)=j$ AND p(n)=1
 THEN  GO TO 4540
4530 NEXT n: PRINT "NOT FOUND":
FOR n=1 TO 200: NEXT n: GO TO 10
00
4540 LET rt=1: GO SUB 7120: GO T
O 1000
7000 FOR x=fl-1 TO 1 STEP -1
7010 FOR y=1 TO x
7020 IF r(y,2)<r(y+1,2) THEN  LE
T n=r(y,1): LET r(y,1)=r(y+1,1):
 LET r(y+1,1)=n: LET n=r(y,2): L
ET r(y,2)=r(y+1,2): LET r(y+1,2)
=n
7030 NEXT y: NEXT x
7035 IF r(1,2)<=10 THEN  CLS : P
RINT "NO CONNECTIONS": FOR n=1 T
O 200: NEXT n: GO TO 1000
7040 CLS : IF r(1,2)>10 THEN  PR
INT "CONNECTION MADE"''"HIGHEST
CONNECTION FACTOR ";r(1,2)
7050 PRINT ''''"PRESS ANY KEY FO
R INFORMATION"
7060 PAUSE 1: PAUSE 0
7100 FOR y=1 TO 5: LET n=r(y,1)
7110 IF r(y,2)<=10 THEN  GO TO 1
000
7115 LET rt=0: GO SUB 7120: NEXT
y: GO TO 1000
7120 CLS : PRINT  INK 4;"NAME: "
; INK 7;n$(n)'m$(n)
7130 PRINT  INK 4;"ADDRESS: "; I
NK 7;'a$(n)'TAB 1;c$(n)'TAB 2;d$
(n)'TAB 3;p$(n)
7140 PRINT  INK 4;"AGE: "; INK 7
;a(n,1)
7150 PRINT  INK 4;"TELEPHONE: ";
 INK 7;t$(n)
7160 PRINT  INK 4;"OCCUPATION:";
 INK 7'o$(n,1)
7170 PRINT  INK 4;"INTERESTS:":
FOR x=1 TO 4: PRINT i$(n,x,1): N
EXT x
7180 PRINT  INK 4;"NATIONALITY:"
; INK 7'z$(n,1)
7190 PRINT  INK 4;"HEIGHT:"; INK
 7;l(n,1);"M", INK 4;"WEIGHT:";
INK 7;w(n,1);"Kg"
7200 PRINT  INK 4;"HAIR COLOUR:
"; INK 7;: RESTORE 9300: FOR x=0
 TO h(n,1): READ h$: NEXT x: PRI
NT h$
7210 PRINT  INK 4;"EYE COLOUR: "
; INK 7;: RESTORE 9400: FOR x=0
TO e(n,1): READ h$: NEXT x: PRIN
T h$
7220 PRINT  INK 4;"MARITAL STATU
S: "; INK 7;: RESTORE 9500: FOR
x=0 TO m(n,1): READ h$: NEXT x:
PRINT h$
7230 IF rt=0 THEN  PRINT #0;"FAC
TOR:";r(y,2);"  [C]opy [N]ext Pe
rson"
7235 IF rt=1 THEN  PRINT #0;"[C]
Copy(16*sp)[N]Return"
7240 PAUSE 0
7250 IF INKEY$="N" THEN  RETURN
7260 IF INKEY$="C" THEN  COPY :
LPRINT "FACTOR: ";r(y,2)''
7270 GO TO 7240
9000 DATA "SURNAME",65,90,65,90,
20
9010 DATA "FIRST NAMES[S]",65,90
,65,90,32
9020 DATA "HOUSE NUMBER & ROAD",
65,90,48,57,32
9030 DATA "TOWN OR CITY",65,90,6
5,90,20
9040 DATA "COUNTY",65,90,65,90,2
0
9050 DATA "POSTCODE",65,90,48,57
,10
9060 DATA "AGE",48,57,48,57,2
9070 DATA "SEX(9*sp)ENTER '0' FO
R MALE(20*sp)'1' FOR FEMALE",48,
49,48,49,1
9080 DATA "TELEPHONE NUMBER",48,
57,48,57,20
9090 DATA "OCCUPATION",65,90,48,
57,32
9100 DATA "1ST INTEREST",65,90,4
8,57,32
9110 DATA "2ND INTEREST",65,90,4
8,57,32
9120 DATA "3RD INTEREST",65,90,4
8,57,32
9130 DATA "4TH INTEREST",65,90,4
8,57,32
9140 DATA "NATIONALITY",65,90,65
,90,32
9150 DATA "HEIGHT [IN METRES]",4
8,57,46,46,6
9160 DATA "WEIGHT [IN KILOGRAMME
S]",48,57,46,46,6
9170 DATA "HAIR COLOUR(33*sp)ENT
ER '0' FOR BLACK(19*sp)'1' FOR B
LOND(19*sp)'2' FOR BROWN(19*sp)'
3' FOR AUBURN(18*sp)'4' FOR RED(
18*sp)'5' FOR GREY(20*sp)'6' FOR
 WHITE",48,54,48,54,1
9180 DATA "EYE COLOUR(35*sp)ENTE
R '0' FOR GREEN(19*sp)'1' FOR BR
OWN(19*sp)'2' FOR BLUE(20*sp)'3'
 FOR GREY",48,51,48,51,1
9190 DATA "MARITAL STATUS(28*sp)
ENTER '0' FOR SINGLE(18*sp)'1' F
OR WIDOWED(17*sp)'2' FOR DIVORCE
D",48,50,48,50,1
9300 DATA "BLACK","BLOND","BROWN
","AUBURN","RED","GREY","WHITE"
9400 DATA "GREEN","BROWN","BLUE"
,"GREY"
9500 DATA "SINGLE","WIDOWED","DI
VORCED"
```





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MAYDAY, mayday. "The ship is sinking Captain. The radio is out and we will have to use the Aldis Lamp to signal a passing vessel. What do you mean, nobody knows how to use Morse Code?"

You can avoid such situations by practising sign language with **Morse Code** for the 48K Spectrum.

Written by David MacKenzie of Skene in Aberdeenshire it will give you practice in sending and receiving signals by sight and sound.

The program uses graphics abbreviations which can be entered using instructions on the first page of Program Printout.

```
  10 PRINT AT 8,11;"MORSE CODE":
AT 10,2;"(Learner to competent r
eader)": PAUSE 100: CLS
  20 BORDER 5: PAPER 6: INK 0: C
LS
  30 POKE 23658,8
  40 LET v=0: LET w=0
  50 DIM m$(37,6 )
  60 RESTORE
  70 LET y=0: LET p=30
  90 PRINT AT 0,14;"MENU";AT 3,0
;  "1  LISTEN AND READ SIMULATED
"'"   MORSE CIPHER (i.e. CONTINU
OUS" "   GROUPS OF FIVE CHARACTE
RS)"''"2  LISTEN TO RANDOM MORSE
"'"   CHARACTERS AND PRESS"'"
APPROPRIATE KEY"''"3  INPUT A LE
TTER,WORD OR A"'"   SENTENCE AND
 LISTEN TO THE"'"   MORSE TRANSL
ATION"''"4  READ ALDIS LAMP IN C
IPHER"
 100 INPUT "ENTER KEY 1 TO 4";a$
: IF a$="" THEN  GO TO 100
 110 IF CODE a$<49 OR CODE a$>52
 OR LEN a$>1 THEN  GO TO 100
 115 PRINT ; PAPER 4;AT 20,0;"EN
TER ANY NUMBER BETWEEN         "'
"12 (FAST) AND 99 (VERY SLOW)
 "
 120 INPUT "ENTER SPEED  ";s$: I
F s$="" THEN  GO TO 120
 130 IF CODE s$<49 OR CODE s$>57
 OR CODE s$(2 TO )<48 OR CODE s$
(2 TO )>57 OR LEN s$<>2 THEN  GO
 TO 120
 135 IF VAL s$<12 THEN  GO TO 12
0
 140 LET s=VAL s$
 150 CLS
 160 PRINT AT 7,0;"YOU MAY SELEC
T ALPHA CHARACTERS"'"ONLY OR A C
OMBINATION OF"'"ALPHANUMERIC CHA
RACTERS"''"ALPHA..............26
"'"ALPHANUMERIC......36": INPUT
 "ENTER APPROPRIATE NUMBER";q$:
IF q$="" THEN  GO TO 160
 170 IF CODE q$<50 OR CODE q$>51
 OR CODE q$(2 TO )<>54 OR LEN q$
<>2 THEN  GO TO 160
 180 LET g=VAL q$
 190 CLS
 200 LET da=s/150: LET dit=s/600
 201 IF s>30 THEN  LET da=.2
 202 IF s>30 THEN  LET dit=.07
 203 IF s>30 THEN  LET o=2+(s-30
)*2
 204 IF s<=30 THEN  LET o=da*30
 205 LET r=o+.75*o
 210 FOR n=1 TO g: READ m$(n): N
EXT n
 220 FOR m=1 TO 5
 230 GO SUB 940
 240 FOR n=2 TO 1
 250 IF a$="1" OR a$="2" THEN  G
O SUB 870
 270 NEXT n
 280 IF a$="1" THEN  GO TO 320
 290 IF a$="2" THEN  GO TO 430
 300 IF a$="3" THEN  GO TO 470
 310 IF a$="4" THEN  GO TO 630
 320 PAUSE o
 321 PRINT AT v,w;c$(1)
 330 IF INKEY$<>"" THEN  GO TO 9
00
 340 PRINT ; PAPER 4;AT 20,0;"PR
ESS ANY KEY TO STOP THEN CHECK"'
"YOUR READING.....No OF WORDS ";
v
 350 LET w=w+1
 360 IF w=5 OR w=11 OR w=17 OR w
=23 THEN  LET w=w+1
 370 IF w=29 THEN  LET v=v+1: LE
T w=0
 380 IF y=20 THEN  GO TO 900
 390 NEXT m
 400 LET y=y+1
 410 PAUSE r
 420 GO TO 220
 430 PRINT AT 10,2;"PRESS CORREC
T KEY - OR ) TO";AT 11,9;"RETURN
 TO MENU"
 435 LET k$=INKEY$
 440 IF k$="" THEN  GO TO 430
 445 IF k$=")" THEN  GO TO 20
 450 IF k$=c$(1) THEN  PRINT ; P
APER 4;AT 0,1;"OK  ";c$: BEEP 1,
12: CLS : GO TO 220
 460 IF k$<>c$ THEN  PRINT ; PAP
ER 4;AT 0,0;"WRONG. CORRECT LETT
ER WAS ";c$: BEEP 2,2: CLS : GO
TO 220
 470 PRINT AT 7,0;" ENTER LETTER
, WORD OR SENTENCES"
 480 PRINT AT 10,0;" ENTER 'ZZZZ
' TO RETURN TO MENU"
 485 PRINT AT 12,0;"(Between sen
tences key in three"'"      space
s instead of ~.~)": INPUT d$
 490 IF d$="ZZZZ" THEN  GO TO 20
 500 FOR n=1 TO LEN d$
 510 IF CODE d$(n)<=57 AND CODE
d$(n)>=48 THEN  LET z=(CODE d$(n
)-21): GO TO 540
 520 IF CODE d$(n)=32 THEN  LET
z=37: GO TO 540
 530 LET z=(CODE d$(n )-64)
 540 FOR m=2 TO LEN m$(z)
 550 IF m$(z,m)="-" THEN  BEEP d
a,p
 560 IF m$(z,m)="." THEN  BEEP d
it,p
 580 NEXT m
 582 IF LEN d$=1 THEN  GO TO 590
 585 PAUSE o
 590 IF LEN d$=1 THEN  PRINT ; P
APER 4; INK 0;AT 0,13;m$(z)(1 TO
)
 600 IF LEN d$>1 THEN  PRINT AT
0,13;"  "
 610 NEXT n
 612 IF LEN d$=1 THEN  GO TO 620
 615 PAUSE r
 620 GO TO 470
 630 PRINT AT 5,0;"IF YOU HAVE S
ELECTED A SLOW"'"SPEED YOU MAY W
ISH TO SEE THE "'"INTERPRETATION
 AT THE SAME TIME"'"AS YOU ARE R
EADING ALDIS LAMP"''"FOR SIMULT
ANEOUS READ AND CHECK ENTER ....
....7"''"FOR CHECK AFTER READING
 ENTER 0"
 631 INPUT "ENTER 0  OR 7";i$: I
F i$="" THEN  GO TO 631
 632 IF i$<>"7" AND i$<>"0" THEN
 GO TO 631
 633 LET i=VAL i$
 635 INK 7: PAPER 0: CLS
 650 PRINT ; PAPER 3;AT 7,14;"WA
IT": PAUSE 200: CLS
 660 FOR m=1 TO 5
 670 GO SUB 940
 680 PRINT ; PAPER 6; INK 0;AT 2
0,0;"PRESS ANY KEY WHEN YOU WISH
      "'"TO CHECK YOUR READING
          "
 690 FOR n=2 TO 1
 700 IF c$(n)="-" THEN  PRINT AT
15,15;"(2*ig8)": PAUSE da*100
 710 IF c$(n)="." THEN  PRINT AT
15,15;"(2*ig8)": PAUSE dit*100
 720 PRINT ; INK 0;AT 15,15;"(3*
ig8)";
 730 IF INKEY$<>"" THEN  GO TO 8
50
 740 PAUSE dit*200
 750 NEXT n
 760 LET w=w+1
 770 PRINT  INK i;AT v,w;c$(1)
 780 IF w=5 OR w=11 OR w=17 OR w
=23 THEN  LET w=w+1
 790 IF w=29 THEN  LET w=0: LET
v=v+1
 800 IF v=15 THEN  GO TO 850
 810 PAUSE o
 820 NEXT m
 830 PAUSE r
 840 GO TO 660
 850 FOR n=0 TO 21: PRINT ; OVER
 1; PAPER 1;AT n,0;"(32*sp)": NE
XT n
 860 PRINT ; INK 7;AT 20,0;"PRES
S ANY KEY TO RETURN TO MENU(33*s
p)": GO TO 910
 870 IF c$(n)="-" THEN  BEEP da,
p
 880 IF c$(n)="." THEN  BEEP dit
,p
 890 RETURN
 900 PRINT ; PAPER 3;AT 20,0;"PR
ESS ANY KEY TO RETURN TO MENU(32
*sp)"
 910 IF INKEY$<>"" THEN  GO TO 9
10
 920 IF INKEY$="" THEN  GO TO 93
0
 930 IF INKEY$<>"" THEN  GO TO 2
0
 935 GO TO 930
 940 LET x=INT ((RND*g)+1)
 950 LET c$=m$(x)
 960 LET l=LEN c$
 970 RETURN
 980 DATA "A.-","B-...","C-.-.",
"D-..","E.","F..-.","G--.","H...
.","I..","J.---","K-.-","L.-..",
"M--","N-.","O---","P.--.","Q--.
-","R.-.","S...","T-","U..-","V.
..-","W.--","X-..-","Y-.--","Z--
..","0-----","1.----","2..---","
3...--","4....-","5.....","6-...
.","7--...","8---..","9----."
 990 DATA  "(sp)"
```

BULLS AND

SPECULATE on the stock market in **Bulls and Bears**, for the 48K Spectrum.

The idea is to buy at a low price and sell when shares rocket, but do not let that stop you making intuitive moves in a sliding market.

The game, written by N T Morgan of Dorchester, was a runner-up in the 1984 Cambridge Awards.

It uses our special abbreviations for graphics characters explained on the first page of Program Printout.




```
   4 RANDOMIZE
   5 POKE 23562,0: POKE 23658,8
  10 LET OIL=5: LET G=500
  20 LET SHIP=5: LET H=500
  30 LET PROP=5: LET I=500
  40 LET TOYS=5: LET J=500
  50 LET MET=5: LET K=500
  55 LET E=1: LET N=0
  60 LET CAR=5: LET L=500
  65 LET D=1
  70 BORDER 0: PAPER 0: INK 7: C
LS
  80 PAPER 6: PRINT AT 8,4;"(19*
sp)"
  90 INK 0: PRINT AT 9,4;" STOCK
S AND SHARES "
 100 PRINT AT 10,4;"(19*sp)"
 110 PRINT AT 15,0;"A game for t
wo to six players"
 120 PRINT AT 21,2;"Instructions
 follow next"
 130 PAUSE 250: CLS
 140 PAPER 0: CLS :
 150 INK 7: PRINT AT 8,0;"The ob
ject of the game is to(4*sp)spec
ulate on the stock market.(2*sp)
To buy shares when prices are(3*
sp)low and to sell when prices a
re higher."'"(8*sp)GOOD  LUCK"
 160 PRINT AT 21,2; FLASH 1;"PRE
SS ANY KEY TO CONTINUE"
 170 PAUSE 5000
 180 INK 1: PAPER 7: BORDER 7: C
LS
 200 CLS : PRINT AT 12,0;"Enter
number of players 2 to 6"
 210 PAUSE 5000
 220 IF INKEY$="2" THEN  LET B=2
: GO TO 290
 230 IF INKEY$="3" THEN  LET B=3
: GO TO 290
 240 IF INKEY$="4" THEN  LET B=4
: GO TO 290
 250 IF INKEY$="5" THEN  LET B=5
: GO TO 290
 260 IF INKEY$="6" THEN  LET B=6
: GO TO 290
 270 IF CODE INKEY$<50 OR CODE I
NKEY$>54 THEN  BEEP 1,25: GO TO
200
 290 CLS : PRINT AT 2,2;"THERE A
RE "; FLASH 1;B;" PLAYERS"
 300 PRINT AT 4,2;"Is this corre
ct enter Y or N"
 310 PAUSE 5000
 320 IF INKEY$="Y" OR INKEY$="y"
 THEN  GO TO 350
 330 IF CODE INKEY$<>89 OR CODE
INKEY$<>121 THEN  GO TO 200
 340 CLS : BORDER 7: PAPER 7: IN
K 0: CLS
 350 DIM W$(B,10)
 355 DIM Z(B): FOR x=1 TO B: LET
 Z(x)=750: NEXT x
 360 CLS : FOR X=1 TO B: PRINT A
T 2+X,2;"ENTER YOUR NAME PLAYER
"; X
 365 IF X>1 THEN  PRINT AT X-1,2
;"PLAYER ";X-1;" ....";W$(X-1)
 370 PRINT AT 1+X,2;"(30*sp)"
 380 INPUT W$(X)
 384 IF X=B THEN  PRINT AT 2+X,2
;"(25*sp)"
 385 IF X=B THEN  PRINT AT X,2;"
PLAYER ";X;" ....";W$(X)
 390 NEXT X
 391 PRINT AT 15,3;"ARE YOUR ENT
RIES CORRECT(13*sp)ENTER "; INVE
RSE 1;"Y"; INVERSE 0;" OR "; INV
ERSE 1;"N": PAUSE 20000
 392 IF INKEY$<>"Y" THEN  GO TO
350
 393 CLS : PRINT AT 3,0;"DO YOU
WISH TO LIMIT THE NUMBER
   OF TURNS";AT 6,12; INVERSE 1;
"Y";  INVERSE 0;" OR "; INVERSE
1;"N": PAUSE 10000: IF INKEY$<>"
Y" THEN  LET V=10000: GO TO 400
 394 INPUT "Enter number of turn
s 10 to 99  ";V
 395 IF V<10 OR V>99 THEN  BEEP
1,20: GO TO 394
 400 FOR X=1 TO B
 410 DIM G(X): DIM H(X): DIM I(X
): DIM J(X): DIM K(X): DIM L(X)
 420 LET G(X)=0: LET H(X)=0: LET
 I(X)=0: LET J(X)=0: LET K(X)=0:
 LET L(X)=0
 430 NEXT X
 440 PAPER 7: CLS : BORDER 4
 444 LET N=N+1: IF N=V THEN  GO
SUB 7000
 445 LET D=D+1: IF D=4 THEN  GO
SUB 6000: PAPER 7: CLS : BORDER
4
 450 PRINT AT 0,5;"OIL SHIP PROP
 TOYS MET CAR"
 460 PRINT AT 1,1;"£10"'" £9"'"
£8"'" £7"'" £6"'" £5"'" £4"'" £3
"'" £2"'" £1"
 470 INK 0: PLOT 248,166: DRAW 0
,-79: DRAW -209,0: DRAW 0,79: DR
AW 209,0
 480 INK 1: FOR Z=1 TO OIL: PRIN
T AT 11-Z,5;"(4*isp)": NEXT Z
 490 INK 5: FOR Z=1 TO SHIP: PRI
NT AT 11-Z,9;"(5*isp)": NEXT Z
 500 INK 1: FOR Z=1 TO PROP: PRI
NT AT 11-Z,14;"(5*sp)": NEXT Z
 510 INK 5: FOR Z=1 TO TOYS: PRI
NT AT 11-Z,19;"(4*sp)": NEXT Z
 520 INK 1: FOR Z=1 TO MET: PRIN
T AT 11-Z,23;"(4*sp)": NEXT Z
 530 INK 5: FOR Z=1 TO CAR: PRIN
T AT 11-Z,27;"(4*sp)": NEXT Z
 535 PAPER 7
 540 INK 0
 554 LET R=14
 555 FOR X=1 TO B
 560 PRINT AT 12,0; INK 2;W$(X);
 PAPER 0; INK 7;" OWNED(2*sp)PRI
CE(2*sp)AVAIL"
 570 PRINT AT 13,0;"OIL"'"SHIPPI
NG"'"PROPERTIES"'"TOYS"'"METALS"
'"CARS"
 605 PRINT AT 13,15;"(4*sp)": PR
INT AT 14,15;"(4*sp)": PRINT AT
15,15;"(4*sp)": PRINT AT 16,15;"
(4*sp)": PRINT AT 17,15;"(4*sp)"
: PRINT AT 18,15;"(4*sp)"
 610 PRINJ AT 13,15;G(X): PRINT
AT 14,15;H(X): PRINT AT 15,15;I(
X): PRINT AT 16,15;J(X): PRINT A
T 17,15;K(X): PRINT AT 18,15;L(X
)
 640 PRINT AT 13,22;"(2*sp)": PR
INT AT 14,22;"(2*sp)": PRINT AT
15,22;"(2*sp)": PRINT AT 16,22;"
(4*sp)": PRINT AT 17,22;"(2*sp)"
: PRINT AT 18,22;"(2*sp)"
 650 PRINT AT 13,22;"£";OIL: PRI
NT AT 14,22;"£";SHIP: PRINT AT 1
5,22;"£";PROP: PRINT AT 16,22;"£
";TOYS: PRINT AT 17,22;"£";MET:
PRINT AT 18,22;"£";CAR
 700 PRINT AT 13,27;"(3*sp)": PR
INT AT 14,27;"(3*sp)": PRINT AT
15,27;"(3*sp)": PRINT AT 16,27;"
(3*sp)": PRINT AT 17,27;"(3*sp)"
: PRINT AT 18,27;"(3*sp)"
 710 PRINT AT 13,27;G: PRINT AT
14,27;H: PRINT AT 15,27;I: PRINT
 AT 16,27;J: PRINT AT 17,27;K: P
RINT AT 18,27;L
 730 PRINT AT 19,10;"(30*sp)"
 740 PRINT AT 19,10; INK 1; FLAS
H 1;"YOU HAVE £";Z(X)
 750 PRINT AT 20,0; INK 2;"DO YO
U WANT TO BUY SELL OR PASS"
 760 PRINT AT 21,0; INK 2;"ENTER
 KEYS(5*sp)'B' 'S'(2*sp)OR(2*sp)
 'P' "
```

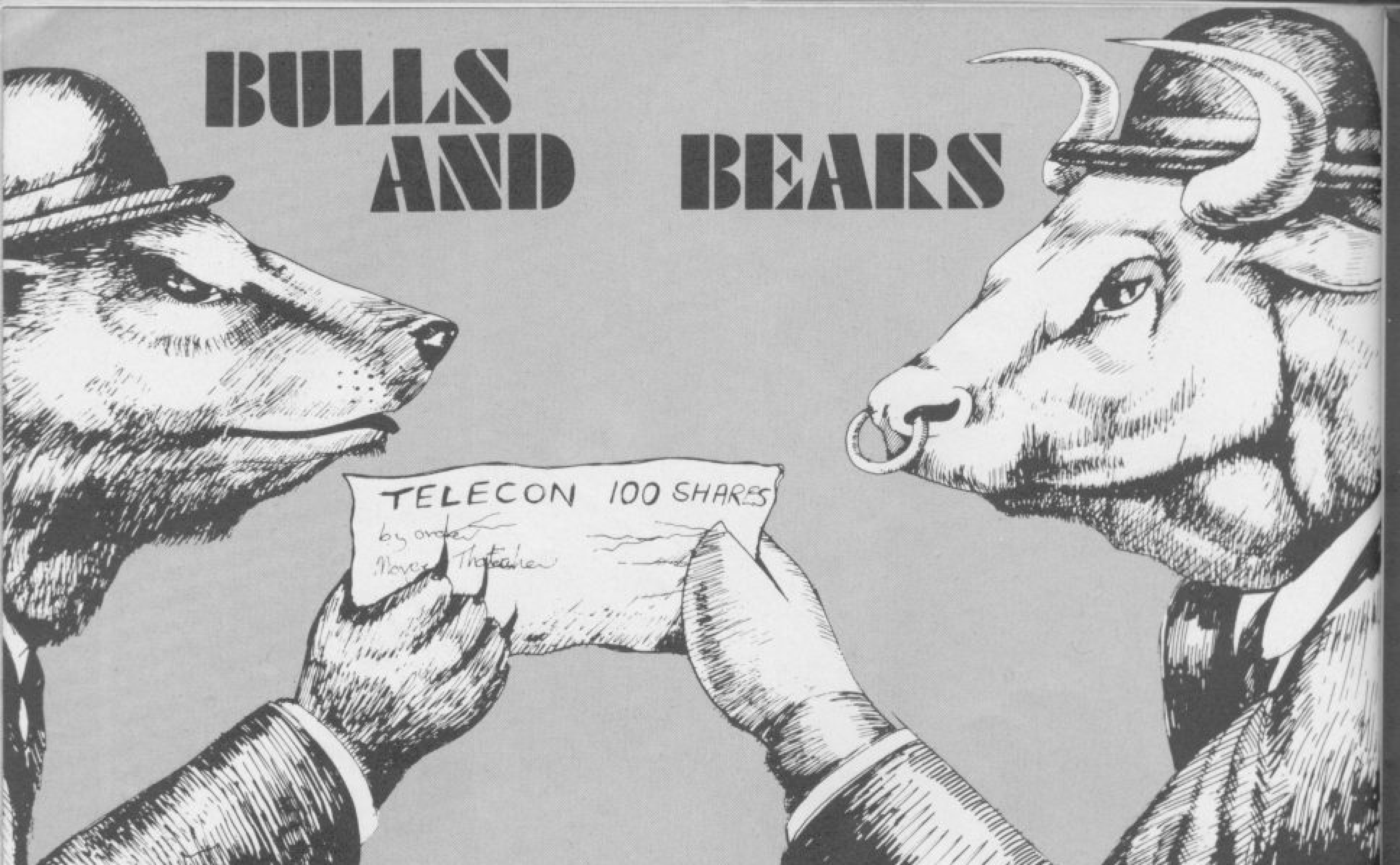
BEARS




```
 770 PAUSE 20000
 780 IF INKEY$="B" THEN  GO TO 1
000
 790 IF INKEY$="S" THEN  GO TO 1
500
 800 IF INKEY$="P" THEN  BEEP .1
,0: BEEP .1,10: BEEP .1,20: BEEP
 .1,30: GO TO 815
 810 BEEP .5,45: GO TO 770
 815 IF X=B THEN  GO TO 2000
 820 NEXT X: GO TO 605
1000 PRINT AT 20,0; INK 2;" ENTE
R THE FIRST LETTER OF THE(3*sp)C
HOSEN SHARE.THEN PRESS ENTER   "
1010 INPUT "ENTER LETTER";Z$
1020 IF Z$="O" THEN  PRINT AT 20
,0;"HOW MANY OIL SHARES WILL YOU
 BUY"; INK 1;"YOU CAN BUY(2*sp)"
;INT (Z(X)/OIL);"(14*sp)": GO SU
B 1800: GO SUB 1750: GO SUB 1200
: LET G(X)=G(X)+Q: LET Z(X)=Z(X)
-(OIL*Q): LET G=G-Q: GO TO 600
1030 IF Z$="S" THEN  PRINT AT 20
,0;"HOW MANY SHIPPING SHARES WAN
TED?"; INK 1;"YOU CAN BUY ";INT
(Z(X)/SHIP);"(16*sp)": GO SUB 18
10: GO SUB 1750: GO SUB 1250: LE
T H(X)=H(X)+Q: LET Z(X)=Z(X)-(SH
IP*Q): LET H=H-Q: GO TO 600
1040 IF Z$="P" THEN  PRINT AT 20
,0;"HOW MANY PROPERTY SHARES WAN
TED?"; INK 1;"YOU CAN BUY ";INT
(Z(X)/PROP);"(16*sp)": GO SUB 18
20: GO SUB 1750: GO SUB 1300: LE
T I(X)=I(X)+Q: LET Z(X)=Z(X)-(PR
OP*Q): LET I=I-Q: GO TO 600
1050 IF Z$="T" THEN  PRINT AT 20
,0;"HOW MANY TOYS SHARES WANTED?
   "; INK 1;"YOU CAN BUY ";INT
(Z(X)/TOYS);"(16*sp)": GO SUB 18
30: GO SUB 1750: GO SUB 1350: LE
T J(X)=J(X)+Q: LET Z(X)=Z(X)-(TO
YS*Q): LET J=J-Q: GO TO 600
1060 IF Z$="M" THEN  PRINT AT 20
,0;"HOW MANY METAL SHARES WANTED
?    "; INK 1;"YOU CAN BUY ";INT
(Z(X)/MET);"(17*sp)": GO SUB 184
0: GO SUB 1750: GO SUB 1400: LET
 K(X)=K(X)+Q: LET Z(X)=Z(X)-(MET
*Q): LET K=K-Q: GO TO 600
1070 IF Z$="C" THEN  PRINT AT 20
,0;"HOW MANY CAR SHARES WILL YOU
 BUY"; INK 1;"YOU CAN BUY ";INT
(Z(X)/CAR);"(15*sp)": GO SUB 185
0: GO SUB 1750: GO SUB 1450: LET
 L(X)=L(X)+Q: LET Z(X)=Z(X)-(CAR
*Q): LET L=L-Q: GO TO 600
1080 IF Z$<>"O" OR Z$<>"S" OR Z$
<>"P" OR Z$<>"T" OR Z$<>"M" OR Z
$<>"C" THEN  BEEP .5,10: GO TO 1
000
1200 IF Q>G OR Q*OIL>Z(X) THEN
BEEP 1,25: GO TO 750
1210 RETURN
1250 IF Q>H OR Q*SHIP>Z(X) THEN
 BEEP 1,25: GO TO 750
1260 RETURN
1300 IF Q>I OR Q*PROP>Z(X) THEN
 BEEP 1,25: GO TO 750
1310 RETURN
1350 IF Q>J OR Q*TOYS>Z(X) THEN
 BEEP 1,25: GO TO 750
1360 RETURN
1400 IF Q>K OR Q*MET>Z(X) THEN
BEEP 1,25: GO TO 750
1410 RETURN
1450 IF Q>L OR Q*CAR>Z(X) THEN
BEEP 1,25: GO TO 750
1460 RETURN
1500 PRINT AT 20,0;" ENTER THE F
IRST LETTER OF THE(3*sp)CHOSEN S
HARE.THEN PRESS ENTER  "
1510 INPUT "ENTER LETTER";Z$
1520 IF Z$="O" THEN  PRINT AT 20
,0;"HOW MANY OIL SHARES FOR SALE
(34*sp)": GO SUB 1750: GO SUB 16
00: LET G(X)=G(X)-Q: LET Z(X)=Z(
X)+(OIL*Q): LET G=G+Q: GO TO 600
1530 IF Z$="S" THEN  PRINT  AT 2
0,0;"HOW MANY SHIPPING SHARES TO
 SELL(31*sp)": GO SUB 1750: GO S
UB 1630: LET H(X)=H(X)-Q: LET Z(
X)=Z(X)+(SHIP*Q): LET H=H+Q: GO
TO 600
1540 IF Z$="P" THEN  PRINT AT 20
,0;"HOW MANY PROPERTY SHARES TO
SELL(32*sp)": GO SUB 1750: GO SU
B 1660: LET I(X)=I(X)-Q: LET Z(X
)=Z(X)+(PROP*Q): LET I=I+Q: GO T
O 600
1550 IF Z$="T" THEN  PRINT AT 20
,0;"HOW MANY TOY SHARES FOR SALE
?(34*sp)": GO SUB 1750: GO SUB 1
690: LET J(X)=J(X)-Q: LET Z(X)=Z
(X)+(TOYS*Q): LET J=J+Q: GO TO 6
00
1560 IF Z$="M" THEN  PRINT AT 20
,0;"HOW MANY METAL SHARES FOR SA
LE(32*sp)": GO SUB 1750: GO SUB
1710: LET K(X)=K(X)-Q: LET Z(X)=
Z(X)+(MET*Q): LET K=K+Q: GO TO 6
00
1570 IF Z$="C" THEN  PRINT AT 20
,0;"HOW MANY CAR SHARES FOR SALE
?(33*sp)": GO SUB 1750: GO SUB 1
730: LET L(X)=L(X)-Q: LET Z(X)=Z
(X)+(CAR*Q): LET L=L+Q: GO TO 60
0
1580 IF Z$<>"O" OR Z$<>"S" OR Z$
<>"P" OR Z$<>"T" OR Z$<>"M" OR Z
$<>"C" THEN  BEEP .75,26: GO TO
1500
1600 IF Q>G(X) THEN  BEEP 1,25:
GO TO 750
1610 RETURN
1630 IF Q>H(X) THEN  BEEP 1,25:
GO TO 750
1640 RETURN
1660 IF Q>I(X) THEN  BEEP 1,25:
GO TO 750
1670 RETURN
1690 IF Q>J(X) THEN  BEEP 1,25:
GO TO 750
1700 RETURN
1710 IF Q>K(X) THEN  BEEP 1,25:
GO TO 750
1720 RETURN
1730 IF Q>L(X) THEN  BEEP 1,25:
GO TO 750
1740 RETURN
1750 INPUT "ENTER NUMBER OF SHAR
ES(2*sp)";Q: RETURN
1800 IF (Z(X)/OIL)>G THEN  PRINT
 AT 21,15; INVERSE 1;G;"(2*sp)":
 RETURN
1801 RETURN
1810 IF (Z(X)/SHIP)>H THEN  PRIN
T AT 21,15; INVERSE 1;H;"(2*sp)"
: RETURN
1811 RETURN
1820 IF (Z(X)/PROP)>I THEN  PRIN
T AT 21,15; INVERSE 1;I;"(2*sp)"
: RETURN
1821 RETURN
1830 IF (Z(X)/TOYS)>J THEN  PRIN
T AT 21,15; INVERSE 1;J;"(2*sp)"
: RETURN
1831 RETURN
1840 IF (Z(X)/MET)>K THEN  PRINT
 AT 21,15; INVERSE 1;K;"(2*sp)":
 RETURN
1841 RETURN
1850 IF (Z(X)/CAR)>L THEN  PRINT
 AT 21,15; INVERSE 1;L;"(2*sp)":
 RETURN
1851 RETURN
2000 RESTORE
2004 IF E>1 THEN  GO TO 2380
2007 LET E=E+1
2100 FOR t=0 TO 7: READ n
2110 POKE USR "a"+t,n: NEXT t
2120 DATA 0,0,10,21,10,21,10,21
2130 FOR t=0 TO 7: READ n
2140 POKE USR "b"+t,n: NEXT t
2150 DATA 0,0,170,85,170,85,170,
85
2160 FOR t=0 TO 7: READ n
2170 POKE USR "c"+t,n: NEXT t
2180 DATA 0,0,168,84,168,84,168,
84
2190 FOR t=0 TO 7: READ n
2200 POKE USR "d"+t,n: NEXT t
2210 DATA 10,21,10,21,10,21,10,2
1
2220 FOR t=0 TO 7: READ n
2230 POKE USR "e"+t,n: NEXT t
2240 DATA 170,85,170,85,170,85,1
70,85
2250 FOR t=0 TO 7: READ n
2260 POKE USR "f"+t,n: NEXT t
2270 DATA 168,84,168,84,168,84,1
68,84
2280 FOR t=0 TO 7: READ n
2290 POKE USR "g"+t,n: NEXT t
2300 DATA 10,21,10,21,10,21,0,0
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BULLS AND BEARS

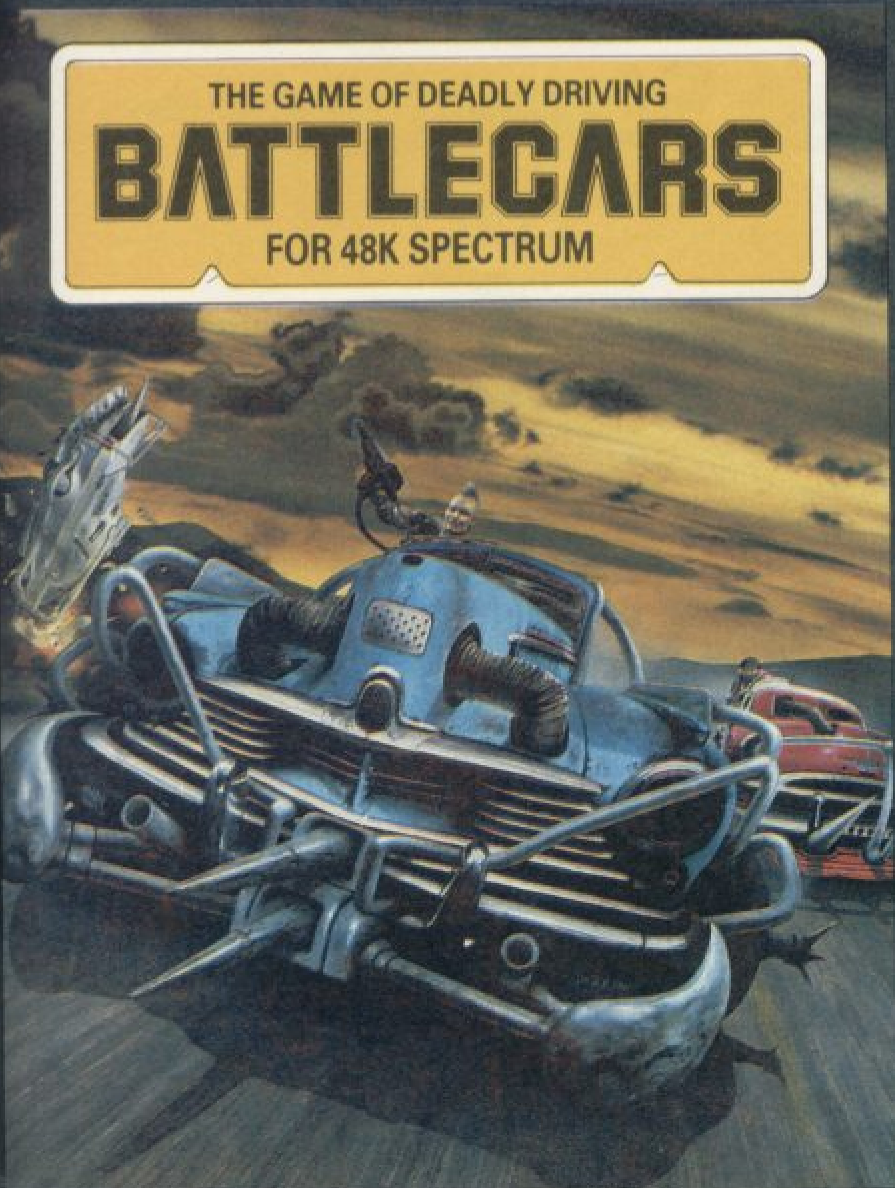


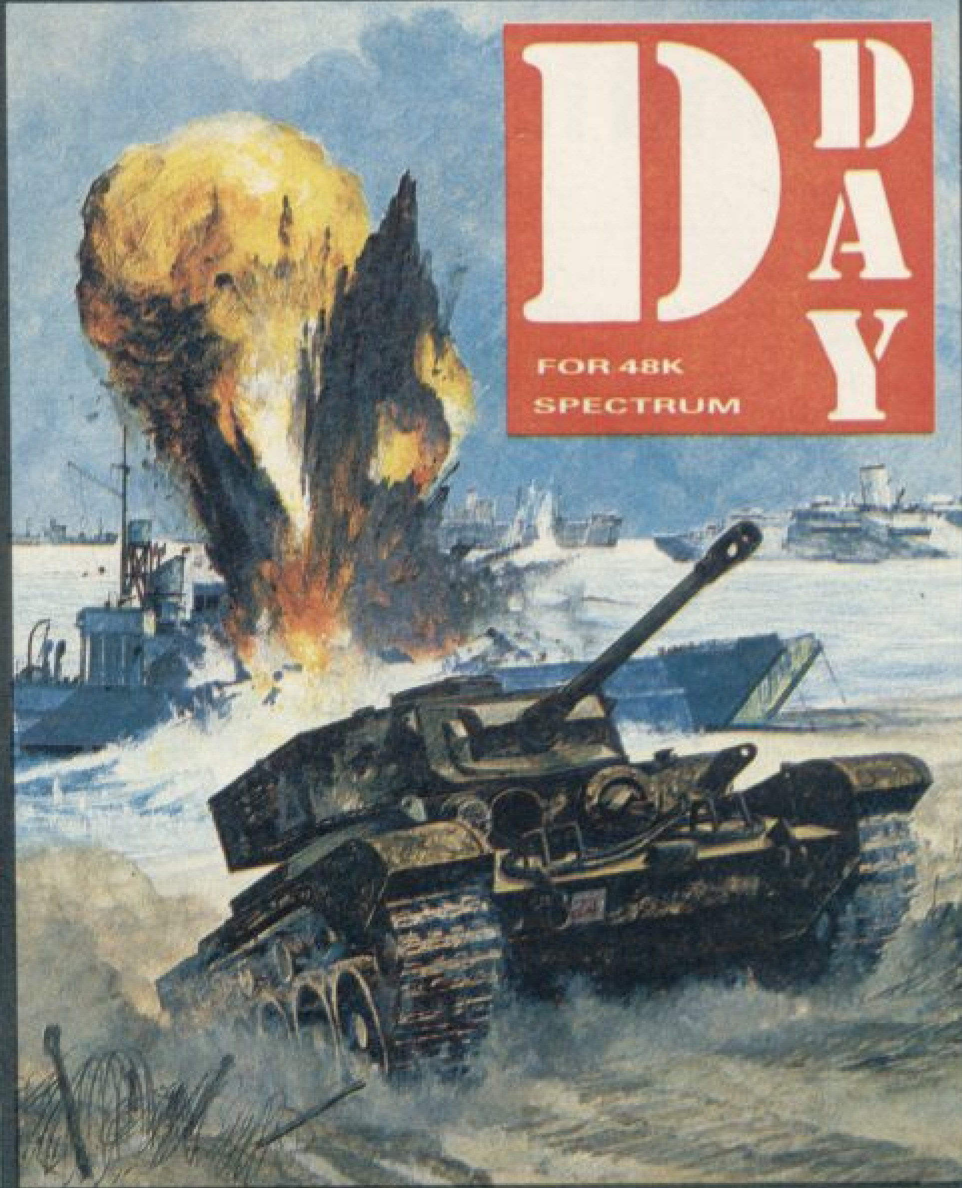
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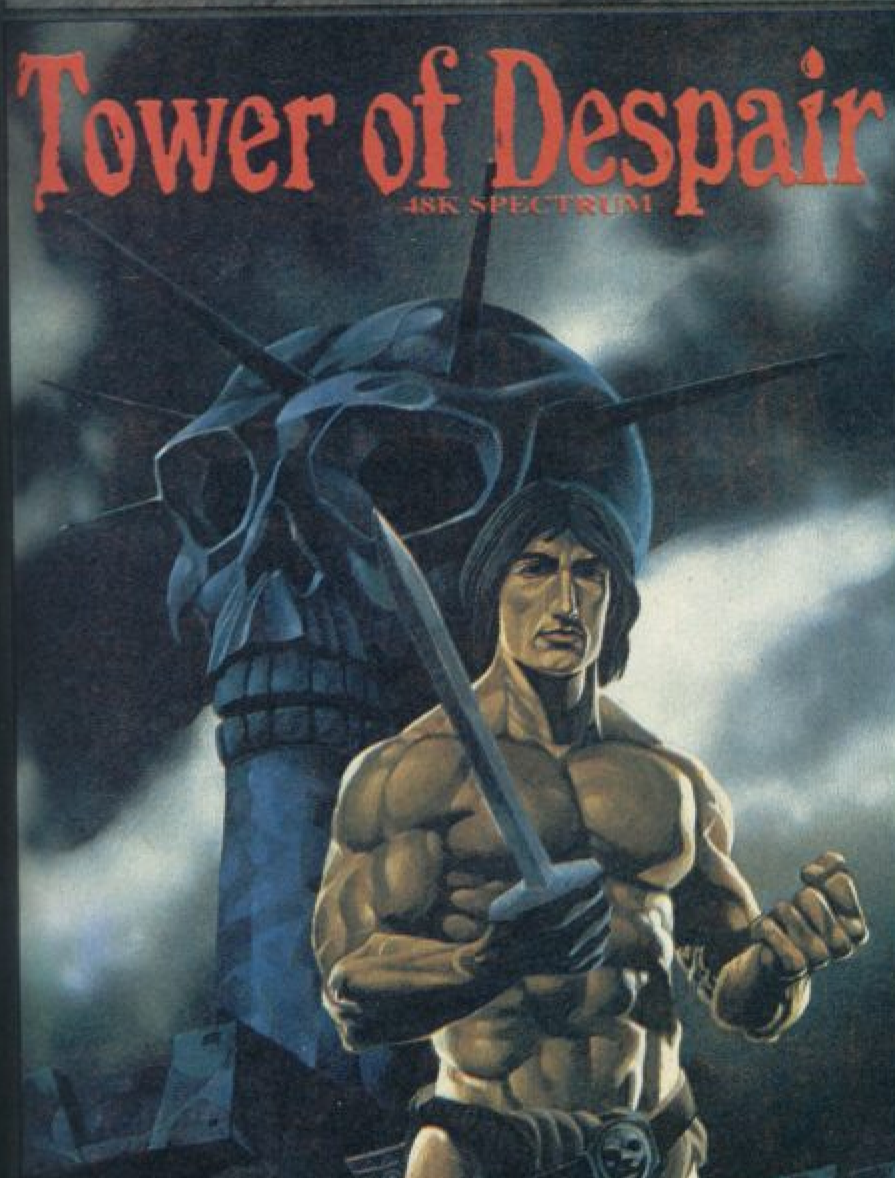
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2310 FOR t=0 TO 7: READ n
2320 POKE USR "h"+t,n: NEXT t
2330 DATA 170,85,170,85,170,85,0
,0
2340 FOR t=0 TO 7: READ n
2350 POKE USR "i"+t,n: NEXT t
2360 DATA 168,84,168,84,168,84,0
,0
2380 FOR Z=12 TO 21
2390 INK 4: PRINT AT Z,0;"(32*sp
)": NEXT Z
2400 FOR X=3 TO 24 STEP 7
2410 INK 2: PAPER 7: PRINT AT 14
,X;"ABBBC"
2420 PRINT AT 15,X;"DEEEF"
2430 PRINT AT 16,X;"DEEEF"
2440 PRINT AT 17,X;"DEEEF"
2450 PRINT AT 18,X;"DEEEF"
2460 PRINT AT 19,X;"GHHHI"
2470 NEXT X
2480 PRINT AT 21,0;"PRESS ANY KE
Y TO TURN THE CARDS"
2490 PAUSE 50000
2495 PRINT AT 21,0; PAPER 4;"(31
*sp)"
2496 PAPER 7
2500 FOR X=3 TO 7
2510 FOR Y=14 TO 19
2520 PRINT AT Y,X;"(sp)"
2530 NEXT Y: NEXT X
2540 GO SUB 3990
2560 PRINT AT 14,3;a;b$;a: PRINT
 AT 19,3;a;b$;a: PRINT AT 16,3;O
$
2700 FOR X=10 TO 14
2710 FOR Y=14 TO 19
2720 PRINT AT Y,X;"(sp)"
2730 NEXT Y: NEXT X
2740 GO SUB 3990
2750 PRINT AT 14,10;a;b$;a: PRIN
T AT 19,10;a;b$;a: PRINT AT 16,1
0;O$
2900 FOR X=17 TO 21
2910 FOR Y=14 TO 19
2920 PRINT AT Y,X;"(sp)"
2930 NEXT Y: NEXT X
2940 GO SUB 3990
2950 PRINT AT 14,17;a;b$;a: PRIN
T AT 19,17;a;b$;a: PRINT AT 16,1
7;O$
3100 FOR X=24 TO 28
3110 FOR Y=14 TO 19
3120 PRINT AT Y,X;"(sp)"
3130 NEXT Y: NEXT X
3140 GO SUB 3990
3150 PRINT AT 14,24;a;b$;a: PRIN
T AT 19,24;a;b$;a: PRINT AT 16,2
4;O$
3155 PAUSE 150
3160 PAPER 4: FOR Z=12 TO 21: PR
INT AT Z,0;"(32*sp)": NEXT Z
3900 GO TO 440
4000 LET a=-3+INT (7*RND)
4005 IF a=0 THEN  GO TO 4000
4010 IF a<0 THEN  LET b$="(sp)"
4020 IF a>=0 THEN  LET b$="(3*sp
)"
4030 GO TO 4080+INT (250*RND)
4100 LET O$="OIL": LET OIL=OIL+a
: GO TO 5100
4150 LET O$="SHIP": LET SHIP=SHI
P+a: GO TO 5150
4200 LET O$="PROP": LET PROP=PRO
P+a: GO TO 5200
4250 LET O$="TOYS": LET TOYS=TOY
S+a: GO TO 5250
4270 RETURN
4300 LET O$="MET": LET MET=MET+a
: GO TO 5300
4350 LET O$="CAR": LET CAR=CAR+a
: GO TO 5350
4355 IF CAR<0 THEN  LET CAR=0
4360 IF CAR>10 THEN  LET CAR=10
4370 RETURN
5100 IF OIL<0 THEN  LET OIL=0
5110 IF OIL>10 THEN  LET OIL=10
5120 RETURN
5150 IF SHIP<0 THEN  LET SHIP=0
5160 IF SHIP>10 THEN  LET SHIP=1
0
5170 RETURN
5200 IF PROP<0 THEN  LET PROP=0
5210 IF PROP>10 THEN  LET PROP=1
0
5220 RETURN
5250 IF TOYS<0 THEN  LET TOYS=0
5260 IF TOYS>10 THEN  LET TOYS=1
0
5270 RETURN
5300 IF MET<0 THEN  LET MET=0
5310 IF MET>10 THEN  LET MET=10
5320 RETURN
5350 IF CAR>10 THEN  LET CAR=10
5360 IF CAR<0 THEN  LET CAR=0
5370 RETURN
6000 CLS : PRINT AT 1,3; INK 1;"
CURRENT CASHFLOW SITUATION": PRI
NT AT 2,10; INK 1; INVERSE 1;"AT
 TURN ";N: PRINT AT 4,0; INK 1:
INVERSE 0;"(3*sp)If all players
were to sell(2*sp)their assets a
t current market(2*sp)prices and
 to add their cash(4*sp)then the
 total amounts availableto each
player would be;"
6010 FOR C=1 TO B: PRINT AT 9+C,
2;W$(C),"£";Z(C)+(G(C)*OIL)+(H(C
)*SHIP)+(I(C)*PROP)+(J(C)*TOYS)+
(K(C)*MET)+(L(C)*CAR): NEXT C
6015 PRINT AT 19,3; FLASH 1; INK
 1;"PRESS ANY KEY TO CONTINUE"
6020 PAUSE 5000: LET D=1: RETURN

7000 CLS : PRINT AT 1,9; INVERSE
 1;"FINAL SCORE": PRINT AT 4,2;"
Your limit of ";V;" turns is now
 complete.When all the shares ar
esold at their current prices th
eorder of wealth between  player
sis as follows;"
7010 FOR C=1 TO B: PRINT AT 9+C,
2;W$(C),"£";Z(C)+(G(C)*OIL)+(H(C
)*SHIP)+(I(C)*PROP)+(J(C)*TOYS)+
(K(C)*MET)+(L(C)*CAR): NEXT C
7020 PRINT AT 19,2; INVERSE 1; F
LASH 1;"Press any key to play ag
ain."
7030 PAUSE 50000: GO TO 1
8999 STOP
9991 INPUT "Old nos; start ";rs;
TAB 11;"end ";re'"New nos;start
";rn;TAB 10;"step ";ri
9992 LET rp=PEEK 23635+256*PEEK
23636
9993 LET rv=PEEK 23627+256*PEEK
23628
9994 LET rl=256*PEEK rp+PEEK (rp
+1)
9995 IF rp>=rv OR rl>re THEN  ST
OP
9996 IF rl>=rs THEN  POKE rp,INT
 (rn/256): POKE rp+1,rn-256*INT
(rn/256): LET rn=rn+ri
9997 LET rp=rp+PEEK (rp+2)+256*P
EEK (rp+3)+4: GO TO 9994
```

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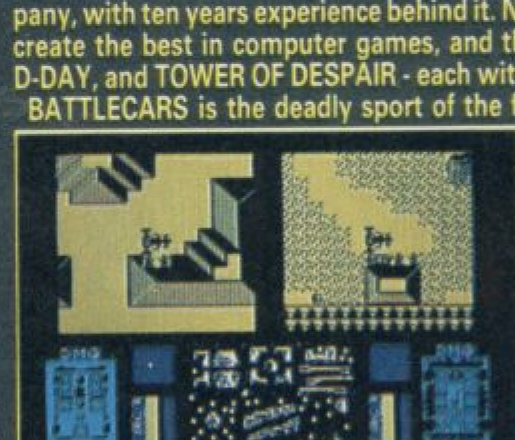




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ISOLATION



CLAUSTROPHOBIA grows as your space shrinks in **Isolation** by James Shaw of Liff on Tayside. The game is for two players and the object is to corner your opponent.

Each player may move one space and then block in a square which then becomes impassable to both. Play continues until one player is unable to move. Moves can be diagonal as well as horizontal or vertical. Isolation runs on the 16K Spectrum.

The program uses our special abbreviations for graphics characters, so please read the instructions on the first page of Program Printout before typing in the program.

```
  10 LET togo=1: DIM z(8): DIM p$(2,22): DIM x(2): DIM y(2): DIM s(2): LET e=0
  20 POKE 23658,8: POKE 23609,175
  30 GO SUB 1260
  40 GO SUB 1420
  50 GO SUB 480
  60 GO SUB 560
  70 REM MAIN ROUTINE
  80 LET x(1)=6: LET y(1)=0: LET x(2)=4: LET y(2)=14
  90 PRINT AT 12,14; FLASH 1; BRIGHT 1; PAPER 7; INK 0;p$(togo)( TO 8);" to move."
 100 LET p=x(togo): LET o=y(togo)
 110 PRINT AT 19,0;"Enter coordinates-(13*sp)"
 120 INPUT d$
 130 LET a=((CODE d$( TO 1))-65)*2
 140 LET d=VAL (d$(2 TO ))
 150 IF e=1 THEN  GO TO 800
 160 IF o<a THEN  GO TO 190
 170 IF o=a THEN  GO TO 200
 180 IF o-a>2 THEN  GO TO 110
 190 IF a-o>2 THEN  GO TO 110
 200 LET b=d*2
 210 IF p>b THEN  GO TO 240
 220 IF p<b THEN  GO TO 250
 230 IF p=b THEN  GO TO 710
 240 IF p-b>2 THEN  GO TO 110
 250 IF b-p>2 THEN  GO TO 110
 260 GO TO 710
 270 IF togo=1 THEN  LET ink=5
 280 IF togo=2 THEN  LET ink=4
 290 IF togo=1 THEN  LET n$=a$
 300 IF togo=2 THEN  LET n$=b$
 310 LET r$="IJKL"
 320 PRINT AT y(togo),x(togo); PAPER 6; INK ink; BRIGHT 0;n$( TO 2);AT y(togo)+1,x(togo);n$(3 TO )
 330 IF o=0 AND p=6 THEN  GO TO 390
 340 IF o=14 AND p=4 THEN  GO TO 390
 350 PRINT AT o,p; PAPER 6; INK 0; BRIGHT 1;r$( TO 2);AT o+1,p;r$(3 TO )
 360 BEEP .3,2
 370 GO SUB 790
 380 GO TO 430
 390 LET r$="(4*ig8)"
 400 PRINT AT o,p; PAPER 7; INK 0; BRIGHT 0;r$( TO 2);AT o+1,p;r$(3 TO )
 410 BEEP .3,2
 420 GO SUB 790
 430 LET togo=togo+1
 440 IF togo=3 THEN  LET togo=1
 450 GO SUB 940
 460 GO TO 90
 470 REM ENTER NAME
 480 CLS : PRINT AT 4,5;a$( TO 2);AT 5,5;a$(3 TO ): PRINT AT 4,9;"Enter name - PLAYER 1": INPUT p$(1)
 490 PRINT AT 4,9;p$(1)
 500 PRINT AT 12,5;b$( TO 2);AT 13,5;b$(3 TO ): PRINT AT 12,9;"Enter name - PLAYER 2": INPUT p$(2)
 510 PRINT AT 12,9;p$(2)
 520 RETURN
 530 GO TO 90
 540 STOP
 550 REM Set-up screen
 560 PAPER 7: BRIGHT 0: FLASH 0: OVER 0: INK 0: CLS : BORDER 3
 570 LET l$="ABCDEFGH"
 580 FOR i=0 TO 7
 590 FOR n=0 TO 5
 600 PRINT AT i*2,n*2; PAPER 6; BRIGHT 1; INK 0;c$( TO 2);AT (i*2)+1,n*2;c$(3 TO )
 610 NEXT n
 620 PRINT AT i*2,n*2; PAPER 7; BRIGHT 1;l$(i+1 TO i+1)
 630 PRINT AT (i*2)+1,n*2; PAPER 7; BRIGHT 1;"(sp)"
 640 NEXT i
 650 FOR i=0 TO 5: PRINT AT 16,i*2; PAPER 7; BRIGHT 1;i;"(2*sp)": NEXT i: BRIGHT 0
 660 PRINT AT 0,6; BRIGHT 0; INK 5;a$( TO 2);AT 1,6;a$(3 TO );AT 14,4; INK 4;b$( TO 2);AT 15,4;b$(3 TO )
 670 PRINT AT 2,14; INK 0; BRIGHT 0;p$(1)(1 TO 8);"(sp)";AT 2,24;a$( TO 2);"(2*sp)";s(1);AT 3,24;a$(3 TO )
 680 PRINT AT 5,14;p$(2)(1 TO 8);"(sp)";AT 5,24;b$( TO 2);"(sp)";s(2);AT 6,24;b$(3 TO )
 690 PRINT AT 0,26;"SCORE": PRINT AT 0,26; OVER 1;"_____": OVER 0
 700 RETURN
 710 REM Check next square
 720 IF ATTR (a,b)=112 OR ATTR (a,b)=56 THEN  GO TO 760
 730 PRINT AT 19,0; PAPER 5; FLASH 1; BRIGHT 1;"YOU CANNOT MOV
```

continued on page 102



continued from page 101

```
E  THERE": BEEP .2,9: BEEP .3,2
 740 PAUSE 100: PAUSE 50
 750 PRINT AT 19,0; PAPER 7;"(21
*sp)": GO TO 110
 760 LET y(togo)=a: LET x(togo)=
b
 770 GO TO 270
 780 REM DROP SQUARE
 790 PRINT AT 19,0;"Enter coords
 for square  to  be dropped.": L
ET e=1: GO TO 120
 800 LET b=d*2
 810 IF ATTR (a,b)=112 THEN  GO
TO 860
 820 PRINT AT 19,0;"(32*sp)": PR
INT "(32*sp)"
 830 PRINT AT 19,0; FLASH 1; PAP
ER 5;"PLEASE TRY AGAIN."
 840 BEEP .2,9: BEEP .3,4: PAUSE
 50
 850 GO TO 790
 860 PRINT AT a,b; BRIGHT 1; INK
 2;"(2*ig8)"
 870 PRINT AT a+1,b; BRIGHT 1; I
NK 2;"(2*ig8)"
 880 BEEP .15,-10
 890 BRIGHT 0: INK 0
 900 PRINT AT 19,0;"(32*sp)"
 910 PRINT AT 20,0;"(32*sp)"
 920 LET e=0
 930 RETURN
 940 REM CHECK NEXT MOVE
 950 LET i=y(togo): LET j=x(togo
)
 960 LET q$="12345678"
 970 IF i=0 THEN  LET q$="45678"
 980 IF i=14 THEN  LET q$="12348
"
 990 IF j=0 THEN  LET q$="23456"
1000 IF j=10 THEN  LET q$="12678
"
1010 IF i=0 AND j=0 THEN  LET q$
="456"
1020 IF i=0 AND j=10 THEN  LET q
$="678"
1030 IF i=14 AND j=0 THEN  LET q
$="234"
1040 IF i=14 AND j=10 THEN  LET
q$="128"
1050 LET z(1)=ATTR (i-2,j-2): LE
T z(2)=ATTR (i-2,j): LET z(3)=AT
TR (i-2,j+2): LET z(4)=ATTR (i,j
+2): LET z(5)=ATTR (i+2,j+2)
1060 LET z(6)=ATTR (i+2,j): LET
z(7)=ATTR (i+2,j-2): LET z(8)=AT
TR (i,j-2):
1070 FOR i=1 TO LEN q$
1080 LET v$=q$(i TO i)
1090 LET v=VAL v$
1100 IF z(v)=112 OR z(v)=56 THEN
  RETURN
1110 NEXT i
1120 LET togo=togo+1
1130 IF togo=3 THEN  LET togo=1
1140 CLS : FLASH 1: PRINT AT 10,
7; BRIGHT 0; PAPER 5;p$(togo)( T
O 8);" has won."
1150 RESTORE 1220: FOR i=1 TO 44
: READ p,d: BEEP (.2*d),p: NEXT
i
1160 PRINT AT 15,6;"ANOTHER GAME
? (Y/N)"
1170 IF INKEY$="Y" THEN  GO TO 1
200
1180 IF INKEY$="N" THEN  STOP
1190 GO TO 1170
1200 LET s(togo)=s(togo)+1
1210 GO TO 60
1220 DATA -5,1,-3,1,-1,1,0,2,-5,
3,0,1,-1,1,0,1,2,2,-3,3,-3,1,-1,
1,0,1,4,1,2,1,2,1,0,1,0,1
1230 DATA -1,1,-3,1,-1,1,-5,6,-5
,1,-3,1,-1,1,0,2,-5,3,0,1,-1,1,0
,1,2,2,-3,3
1240 DATA -3,1,-1,1,0,1,4,1,2,1,
2,1,0,1,0,1,-1,1,-3,1,-1,1,0,6
1250 REM U.D.G.'s
1260 RESTORE 1290: FOR i=0 TO 95
: READ a: POKE USR "a"+i,a: NEXT
 i
1270 LET a$="ABCD":
LET b$="EFGH
": LET c$="IJKL"
1280 RETURN
1290 DATA 0,0,3,3,12,12,51,51
1300 DATA 0,0,192,192,48,48,204,
204
1310 DATA 51,51,12,12,3,3,0,0
1320 DATA 204,204,48,48,192,192,
0,0
1330 DATA 0,0,48,48,15,15,12,12
1340 DATA 0,0,12,12,240,240,48,4
8
1350 DATA 12,12,15,15,48,48,0,0
1360 DATA 48,48,240,240,12,12,0,
0
1370 DATA 255,224,192,128,128,12
8,128,128
1380 DATA 255,7,3,1,1,1,1,1
1390 DATA 128,128,128,128,128,19
2,224,255
1400 DATA 1,1,1,1,1,3,7,255
1410 REM INSTRUCTIONS
1420 CLS : LET m$=". . .  I S O
L A T I O N  . . . ": LET c=31
1430 FOR i=1 TO LEN m$: PRINT AT
 0,c; BRIGHT 1;m$(1 TO i): LET c
=c-1: NEXT i
1440 PRINT AT 1,11; PAPER 5;"By
J.D.SHAW"
1450 PRINT AT 3,0;"This is a gam
e of strategy based"'"on a board
 game for 2 players."'"The aim o
f the game is to "'"surround you
r opponent with the"'"dropped sq
uares and ISOLATE him!"''"The se
quence of events for each"'"play
er is as follows:-" '"1.PLAYER M
OVES HIS/HER PIECE ONE  SQUARE I
N ANY DIRECTION."''"2.THE PLAYER
 THEN CHOOSES A        SQUARE THA
T IS DROPPED OUT OF    THE GAME A
ND CANNOT BE USED."''"3.THE SECO
ND PLAYER THEN DOES      THE SAME
."
1460 PRINT AT 21,4;"PRESS ANY KE
Y TO CONTINUE": PAUSE 0
1470 FOR i=21 TO 3 STEP -1: PRIN
T AT i,0;"(32*sp)": NEXT i
1480 PRINT AT 3,0; FLASH 1; BRIG
HT 1;"NOTE"
1490 PRINT '"1.THE 2 STARTING SQ
UARES (BLACK)  CANNOT BE 'DROPPE
D'."
1500 PRINT '"2.THE COMPUTER WILL
 CHECK TO SEE  IF ALL THE MOVES
ARE VALID!"
1510 PRINT '"3.THE COMPUTER WILL
 CHECK TO SEE  IF EITHER PLAYER
HAS WON."
1520 PRINT AT 21,4;"PRESS ANY KE
Y TO CONTINUE": PAUSE 0
1530 RETURN
1540 STOP
```

WINDOW 81

```
   1 PRINT 1+2+3+4+5+6+7+8+9+10+
11+12+13
   2 REM WINDOW A=USR 16514
   3 REM WINDOW B=USR 16527
   4 REM WINDOW C=USR 16544
   5 REM WINDOW D=USR 16561
  10 POKE 16510,0
  15 POKE 16513,234
  20 LET A$="2A0C40CDC24021210E2
23940C92A0C40111000019CDC2"
  30 LET A$=A$+"4021110E223940C9
2A0C40116B0119CDC2402121032 2"
  40 LET A$=A$+"3940C92A0C40117B
0119CDC240211103223940C91121"
  50 LET A$=A$+"00ED52060BC519E5
D523D5C1E5D109011000EDB0D1E1"
  60 LET A$=A$+"C110EC0610233600
10FB110F00ED52220E40C9"
  70 IF LEN A$<>214 THEN STOP
  80 FAST
  90 FOR N=16514 TO 16620
 100 POKE N,CODE A$*16+CODE A$(2
)-476
 110 LET A$=A$(3 TO )
 120 NEXT N
 130 SLOW
1000 REM DEMONSTRATION
1005 FOR N=0 TO 127
1010 RAND USR 16514
1015 PRINT CHR$ N;"-";CHR$ N
1020 RAND USR 16527
1025 PRINT CHR$ (N+128);"-";CHR$
 (N+128)
1030 RAND USR 16544
1035 PRINT CHR$ (N+128);"-";CHR$
 (N+128)
1040 RAND USR 16561
1045 PRINT CHR$ N;"-";CHR$ N
1050 NEXT N
```



CREATING and scrolling windows on the screen has always been the province of the QL.

Window 81, a utility from John Mitchell of Doncaster, for the 16K ZX-81, puts four windows on the screen and gives a demonstration of scroll in all four.

Each window is invoked using machine code calls, a list of which are shown in lines two to five. For example, if you want to scroll window A type RAND USR 16514 in your program.

GOBLIN MATHS



THE GOBLINS are out to get you but you cannot fight back and escape in your helicopter until you answer all the sums supplied by the 16K ZX-81.

In this two part educational game, by A J Parkhouse of Liverpool, you play the ghost with an arithmetic turn of mind. It may be one for the children but that does not mean adults won't learn something.

```
  10 PRINT AT 6,2;"ANSWER SIX SUMS AND THEN HELP"
  15 PRINT AT 8,2;"THE GHOST TO ESCAPE FROM THE"
  18 PRINT AT 10,10;"GREEDY GOBLINS"
  20 PRINT AT 14,7;"PRESS ""1"" TO START"
  22 IF INKEY$="" THEN GOTO 22
  23 CLS
  25 PRINT AT 0,0;"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■"
  30 PRINT AT 21,0;"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■"
  35 FOR L=1 TO 20
  40 PRINT AT L,0;"■";AT L,31;"■"
  50 NEXT L
  60 PRINT AT 0,14;"SUMS"
  70 PLOT 0,1
  80 PLOT 63,1
  90 LET T=0
 100 DIM Q$(2)
 110 LET Y=2
 115 LET X=5
 120 FOR Z=1 TO 6
 130 LET R=INT (RND*9)+1
 140 LET RR=INT (RND*9)+1
 150 PRINT AT Y,X;R
 160 PRINT AT Y+1,X-2;"+ ";RR
 170 PRINT AT Y+2,X-2;"---"
 175 PRINT AT Y+4,X-2;"==="
 180 FOR L=2 TO R+R STEP 2
 190 PRINT AT L,23;"■"
 200 NEXT L
 210 FOR L=2 TO RR+RR STEP 2
 220 PRINT AT L,28;"▒"
 230 NEXT L
 250 GOTO 270
 260 PRINT AT 20,5;"NUMBERS ONLY PLEASE"
 270 INPUT Q$
 280 PRINT AT 20,5;"        I AM THINKING"
 290 FOR L=1 TO 2
 300 IF Q$(L)>"A" AND Q$(L)<"Z" THEN GOTO 260
 310 NEXT L
 320 IF CODE Q$<28 OR CODE Q$>37 THEN GOTO 260
 330 LET Q=VAL Q$
 340 LET T=T+1
 350 IF Q=R+RR THEN GOTO 390
 360 PRINT AT Y+3,X+2;"X"
 370 PRINT AT 20,5;Q;" IS WRONG TRY AGAIN"
 380 GOTO 270
 390 IF Q>9 THEN PRINT AT Y+3,X-1;Q
 400 IF Q<=9 THEN PRINT AT Y+3,X;Q
 410 PRINT AT 20,5;"          CORRECT"
 420 PRINT AT Y+3,X+2;"/"
 430 IF Y=14 THEN LET X=16
 440 LET Y=Y+6
 450 IF X=16 AND Y=20 THEN LET Y=2
 460 FOR L=2 TO 18 STEP 2
 470 PRINT AT L,23;" ";AT L,28;" "
 480 NEXT L
 490 PRINT AT 20,5;"                    "
 500 NEXT Z
 510 PRINT AT 2,20;"YOU  TOOK";AT 4,20;T;" GOES TO";AT 6,20;"ANSWER  6"
 520 PRINT AT 8,20;"SUMS  YOU"
 530 IF T=6 THEN PRINT AT 10,20;"BRAIN BOX";AT 12,20;"ENJOY YOUR";AT 14,23;"GAME"
 540 IF T=7 THEN PRINT AT 10,20;"TRIED HARD";AT 12,20;"WELL DONE"
 550 IF T=8 THEN PRINT AT 10,20;"DUST BRAIN"
 560 IF T>8 THEN PRINT AT 10,20;"DING BAT"
 570 PRINT AT 20,7;"PRESS ""1"" FOR GAME"
 580 IF INKEY$="1" THEN RUN 600
 590 GOTO 580
 600 CLS
 605 PRINT AT 6,3;"HELP THE GHOST THROUGH THE"
 606 PRINT AT 8,3;"GREEDY GOBLINS MAZE TO HIS"
 607 PRINT AT 10,11;"HELICOPTER"
 608 PRINT AT 12,4;"USE KEYS ""5"" ""6"" ""7"" ""8"""
 610 PRINT AT 16,7;"PRESS ""1"" TO START"
 615 IF INKEY$="" THEN GOTO 615
 617 CLS
 620 PRINT AT 0,2;"---"
 625 PRINT AT 1,1;"+■■"
 630 PRINT AT 2,4;"■■■■■■■■■■■■■■■■■■■■■■■■■■■■"
 633 PRINT AT 6,3;"■■■■■■■■■■■■■■■■■■■■■■■■■■■■"
 634 PRINT AT 0,2;" - "
 635 PRINT AT 2,2;"■";AT 3,2;"■";AT 4,2;"■";AT 5,2;"■"
 638 PRINT AT 5,2;"■";AT 6,2;"■";AT 5,21;"■"
 639 PRINT AT 0,2;"---"
 640 PRINT AT 3,4;"■ ■    ■  ■"
 645 PRINT AT 4,8;"■";AT 4,14;"■"
 648 PRINT AT 0,2;" - "
 650 PRINT AT 5,6;"■   ■   ■"
 660 PRINT AT 3,21;"■";AT 4,21;"■"
 690 PRINT AT 16,25;"■■■■"
 695 PRINT AT 0,2;"---"
 700 PRINT AT 17,24;"■■■■■"
 710 PRINT AT 18,25;"■■■■"
 720 PRINT AT 19,25;"■■■■"
 725 PRINT AT 0,2;" - "
 730 PRINT AT 20,25;"■■ ■■"
 765 LET Y=4
 766 LET X=20
 770 PRINT AT Y,X;"■"
 780 GOTO 800
 790 PRINT "■"
 800 PRINT AT 0,2;"---"
 810 LET XX=X
 820 LET YY=Y
 830 LET X=X-(INKEY$="5" AND X>3)+(INKEY$="8" AND X<20)
 840 LET Y=Y-(INKEY$="7" AND Y>3)+(INKEY$="6" AND Y<5)
 850 PRINT AT 0,2;" - "
 860 PRINT AT YY,XX;" "
 870 PRINT AT Y-2,X;
 880 IF PEEK (PEEK 16398+256*PEEK 16399)=128 THEN GOTO 975
 885 PRINT AT Y,X;
 890 IF PEEK (PEEK 16398+256*PEEK 16399)=151 THEN GOTO 915
 910 GOTO 790
 915 PRINT AT Y,X;"■";AT 0,2;"---"
 920 PRINT AT 7,1;"YOU HAVE JUST BEEN EATEN BY A  GREEDY GOBLIN SO START AGAIN"
 923 PRINT AT Y,X;"■";AT 0,2;" - "
 925 PRINT AT 9,9;"PRESS ""1"""
 930 PRINT AT Y,X;"■";AT 0,2;"---"
 933 FOR L=1 TO 3
 934 NEXT L
 935 PRINT AT Y,X;"■";AT 0,2;" - "
 940 IF INKEY$<>"1" THEN GOTO 930
 950 PRINT AT 7,1;"                                "
 960 PRINT AT 9,9;"                "
 970 GOTO 765
 975 PRINT AT Y,X;"■"
 980 PRINT AT 0,2;" - "
 985 FOR L=1 TO 4
 986 NEXT L
 990 PRINT AT Y,X;" ";AT 0,2;"---"
 995 PRINT AT Y-1,X;"■";AT 0,2;" - "
 997 FOR L=1 TO 4
1000 NEXT L
1003 LET A=1
1005 LET X=0
1010 LET Y=0
1020 LET B$="                                "
1030 LET A$="  ---                     +■■"
1040 PRINT AT Y,X;A$
1050 PRINT B$
1060 PRINT B$
1070 PRINT B$
1080 PRINT B$
1090 PRINT B$
1100 LET X=X+1
1102 LET YY=17
1103 LET XX=18
1105 LET Y=Y+1
1107 PRINT AT Y-1,X+1;"   "
1110 PRINT AT Y,X;A$
1140 IF Y=15 THEN GOTO 1160
1145 PRINT AT Y,X+2;" - "
1150 GOTO 1100
1160 FOR K=1 TO 16
1163 IF K>12 THEN PRINT AT YY,XX;" "
1165 IF K>6 AND K<12 THEN PRINT AT YY,XX;"■"
1170 PRINT AT Y,X+2;" - "
1180 FOR L=1 TO 2
1190 NEXT L
1191 IF K=12 THEN PRINT AT YY,XX+1;"■"
1192 IF K=6 THEN PRINT AT 16,18;"■"
1193 IF K>1 THEN LET A=A+1
1195 IF K>1 AND K<7 THEN PRINT AT Y+A,X+3;"H"
1200 PRINT AT Y,X+2;"---"
1203 IF K>6 AND K<12 THEN PRINT AT YY,XX;"H"
1205 IF K>6 AND K<11 THEN LET YY=YY+1
1207 IF K>12 THEN LET YY=YY-1
1210 NEXT K
1215 PRINT AT 17,18;"  "
1220 LET A=0
1230 LET A$(36)="■"
1240 FOR L=15 TO 0 STEP -1
1260 PRINT AT L,X;A$
1270 PRINT AT L,X+2;"   "
1320 PRINT AT L+1,X;"        "
1330 NEXT L
1340 FOR L=19 TO 26
1360 PRINT AT 21,L;" ■"
1370 NEXT L
1380 PRINT AT 21,27;" "
1390 PRINT AT 20,27;"■"
1400 FOR K=1 TO 2
1405 NEXT K
1410 PRINT AT 20,27;"■"
1420 PRINT AT 10,3;"PRESS ""1"" FOR ANOTHER GAME"
1430 IF INKEY$="" THEN GOTO 1430
1440 RUN 23
1500 SAVE "GHOST SUMS"
1510 RUN
```



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Explore beyond the final frontier

John Gilbert shows how to map an artificially intelligent adventure in the first of a six-part series

THE POWER, playability and scope of adventure games has been increased with the introduction of concepts of artificial intelligence in games such as **The Hobbit, Sherlock** and, to some extent, **Valhalla**.

Those techniques make characters lead lives of their own in the adventure environment created by the programmer and adds extra 'real time' depth to games. You have, no doubt, read articles on how to program adventure games. Those often start with the planning of an adventure and go through programming step-by-step. You usually end with a listing which allows you to move around an adventure world pick up objects and do little else.

This series, however, is different. In addition to explaining the latest techniques which are being used in adventure games, it also sets out to show a completely new approach to adventure gaming. It is an approach which will not only allow you to enter an imaginary world which you have created but also to talk to the characters and live the part of the adventurer. That is done by using techniques of artificial intelligence which have been converted to work in a games environment.

Over the next five months an incredible amount of ground will be covered. Starting with how to convert landscape from paper into a data structure of a program the series will cover the creation of believable characters. All you have to do is define the rules for their behaviour and they will react in an original way to any situation which may crop up within an adventure. In effect you will be playing god in a world where anything goes.

You may be surprised to learn that the techniques are to be described in that bane of all professional programmers, Basic. It should be admitted that Basic is a far from ideal language but it was chosen because it is easy to convert ideas into its programming language structure. That structure is so much like English in its approach that you should be able to convert the routines in series into any other language which you require. Pascal, C, BCPL — it doesn't matter, conversion is simple but the techniques will work just the same.

The routines have been designed to work with all Sinclair machines except, unfortunately the ZX-81. Where QL programs will run better if written differently to those of the Spectrum single-line alterations have been noted in the diagrams.

As you are likely to have read something elsewhere about writing adventure games we will not deal with plotting in any great detail. Suffice it to say that you should use all avenues of research possible and do not shy

away from using real life situations rather than going for fantasy and science fiction.

When you have your plot make a list of the locations in which your characters are going to stomp and then translate them to an adventure grid such as the one from Print n' Plotter.

Your adventure might have several levels, involving climbing stairs or walking down into valleys, so to keep a record of each adventure you should label them with level number first and then the location number. Those location references may bear no resemblance to the references used within the program but they act as a guide to both programmer and adventure creator.

In the adventure created in this series the loss of a ship at sea has been combined with a science fiction plot which will be expanded as the series continues. The Crysan, a clock which powers the time flow of the universe has been stolen by raiders who escape on a luxury Delta Class yacht, owned by the moderator of the marine institute based on an island near the Florida Keys.

The clock has been re-programmed by the reprobates — whoever they are

```
 10 DIM g$(3,3,10)
 20 FOR k=1 TO 3
 30 FOR l=1 TO 3
 40 READ g$(k,l)
 50 NEXT l: NEXT k
 60 DATA "Sea","Sea","Sea"
 70 DATA "Sea","Quay","Sea"
 80 DATA "Sea","Quay","Sea"
 90 REM PRINT ROUTINE
100 FOR k=1 TO 3
110 FOR l=1 TO 3
120 PRINT g$(k,l);" ";
130 NEXT l
140 PRINT
150 NEXT k
```

Listing 1

— and time is running backwards throughout the universe. The Moderator, Kagan, and two research scientists, Morris and Marla, must search for the clock as the universe rushes towards its birth and the destruction of everything.

The plot calls for a first location at the quayside. Moving right you can step onto the deck of a motor launch. The results of movements in other directions around the quayside are shown in part of the map in figure one. It shows five locations which will be greatly expanded as the adventure progresses.

As this point in writing the game you may realise that putting a one or two word description of a location into a map grid is easy but you also have to

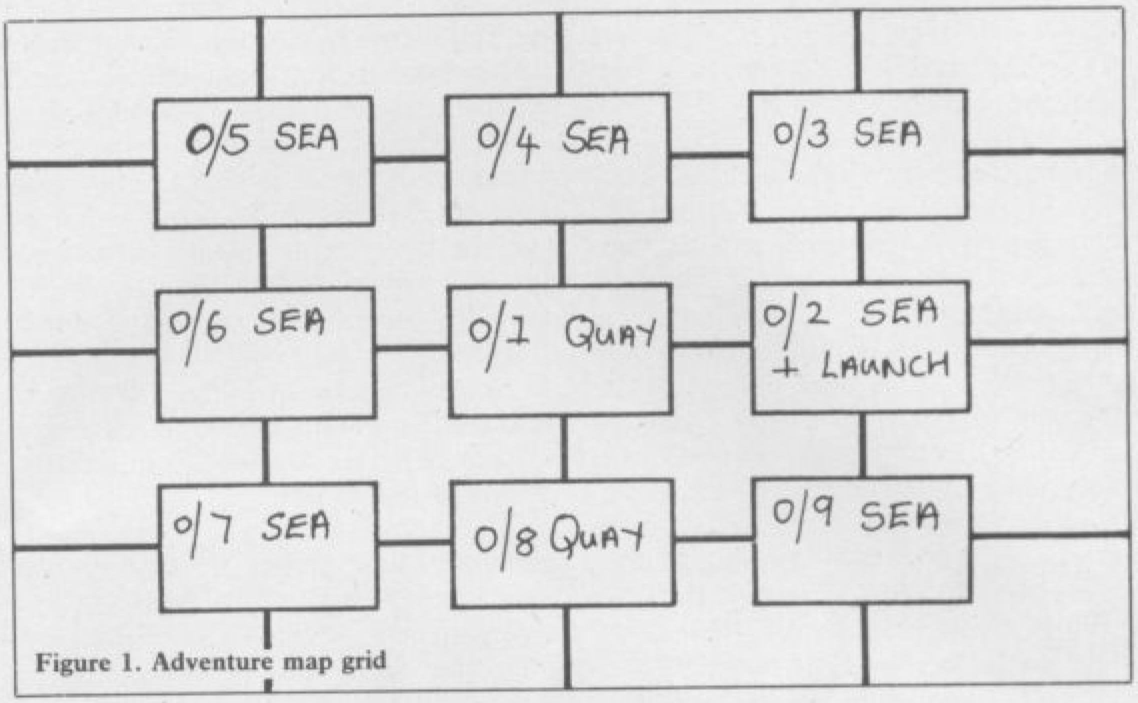


Figure 1. Adventure map grid

fit in a long description which will be used in the game and a description of any objects which might be found there.

The best way to log location descriptions is on index file record cards. Put the reference number at the top followed by a short description, then a long description followed by any objects which can be found in the area.

A typical location record is shown on figure two and it is the first location of the adventure. The base level is taken as level zero. Any level above that will be positive and any level below will be negative. For instance, the top deck of the yacht, when the three adventurers find it, will be listed as 1 whereas the engine room would be listed as -1. A full reference for the location of the engine room would be -1/1.

When moving from plan to program you will find that locations and objects can clash and make the exercise more complicated than it should be. The motor launch in figure one poses a problem which, although not obvious, will have an effect on the structure of the program and the adventure world. That problem is whether to make the launch a location or whether is should be treated as an object and as such be movable.

If the launch is treated as an object you could dismiss it from your mind until you deal with object placement. In that case the location description would be that of sea, as it is in figure two.

Treating the launch as an object has certain advantages as you could move it around and use it later in the game. It would also mean that the characters in the adventure could use it to travel anywhere on water without having to conform to a set pattern of moves for the boat. In the case of the example you should think of the player and the flexibility of the game; a movable boat is better than a path of fixed locations within an adventure.

The former course of action is obviously the best for an artificially intelligent game. The only data structure in the Basic language is the array and it is bound to be the one with which you are most familiar. For that reason we will take it as a starting point for the construction of the adventure structure.

The program in listing one places the representation of the map in figure one into a two dimensional data array which is three elements wide and three deep. Each element has room for a ten character location description. That only applies to the Spectrum as on that machine you must dimension the maximum length of a string in an array. Using arrays on the QL is much easier as you have no maximum string length with which to cope. Spectrum owners, unfortunately, are going to have more coding to do than QL owners during the series.

The next part of the program in listing one, between lines 60 and 80, shows how the map is set up in memory using the READ statement in line 40. If you were writing the adventure in machine code you would create a block of data which, when tabulated on a page, would look like the data in the Basic program. As far as presentation is concerned it is just as well to take this leaf out of the machine code programmer's book. It also means that you can type in one line of locations at a time and only have to keep track of that line.

continued on page 108

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The next part of the program is just for your benefit. It prints out the location matrix onto the screen in the form in which you represent it. You may like to keep this routine for checking your own programs as you can look at part of, as well as all of, a data array.

Although the program in listing one is basically sound and will work it wastes memory shamelessly. As you can see we have five sea locations and two quay locations each of which are entered using a loop. You have had to enter data statements containing the words 'sea' and 'quay' several times.

That is where Basic falls down but there is a way around the problem and that is to specifically design a way of getting as many locations set up without having to duplicate descriptions. Unfortunately there is no hard and fast magical method of doing it. The best way in Basic is that if you have only a few types of location, such as 'sea' or 'quay', you could set up a loop to deal with each and produce a formula to produce those locations. For instance, the majority of locations in figure one consist of 'sea' with only two made up of 'quay'. We need a way of reducing the number of data statements in listing one.

```
  5 DIM g$(3,3,10)
 10 FOR k=1 TO 3
 20 LET g$(1,k)="Sea"
 30 NEXT k
 40 FOR k=1 TO 3
 50 FOR l=1 TO 3 STEP 2
 60 LET g$(k,l)="Sea"
 70 NEXT l
 80 NEXT k
 90 FOR k=1 TO 3
100 FOR l=1 TO 3
110 PRINT g$(k,l);" ";
120 NEXT l
130 NEXT k
```

Listing 2

The solution to the problem is shown in listing two. Two loops are used. The first fills 'sea' into the top layer of the array map and the second does the fiddly bits down the side. That solution is applicable only to the example. You will have to produce your own loops and do your own arithmetic to get it to work in any adventures that you create but the method is simple once you grasp the nature of the loop definition. As you can see, the hard work is worthwhile as you can cut down many lines of data to a few lines of program code and, as promised, you have only to write out each program location type once.

There is another advantage to doing it the loop way. Speed is something that any Basic programmer should keep in mind when writing code. It can take up to half a minute for a Spectrum to set up an array which is only 100x100 elements big. Using the loop method your adventure world data should be set up in a matter of seconds. The more duplication of locations that there are the faster the data will be set up.

Next month we will explore the further complexities of the Crysan Project and see how objects can be superimposed onto locations within an adventure. As you will see, objects can affect all aspects of locations including the weather. Until then we leave you in your launch waiting to go after the Crysan clock.

SEA
You have landed in the sea. The water is icy cold and your limbs are becoming numb.

+ Launch
You are in the motor launch which bobs gently on the water.

OBJECTS: key to launch

Figure 2. Adventure record card.



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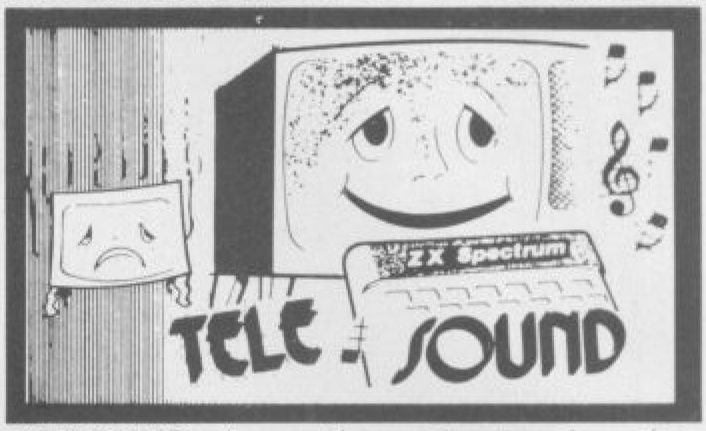
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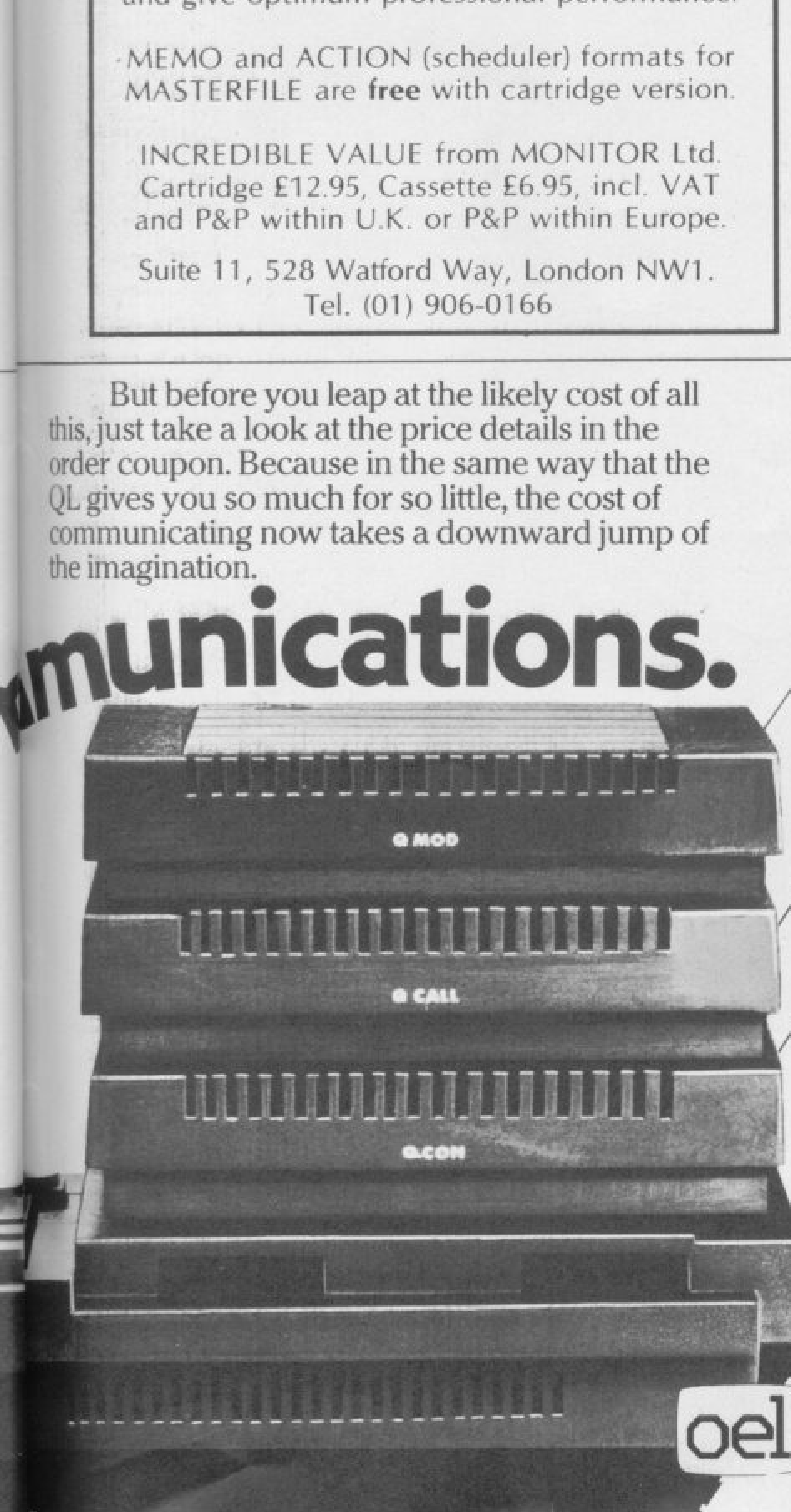
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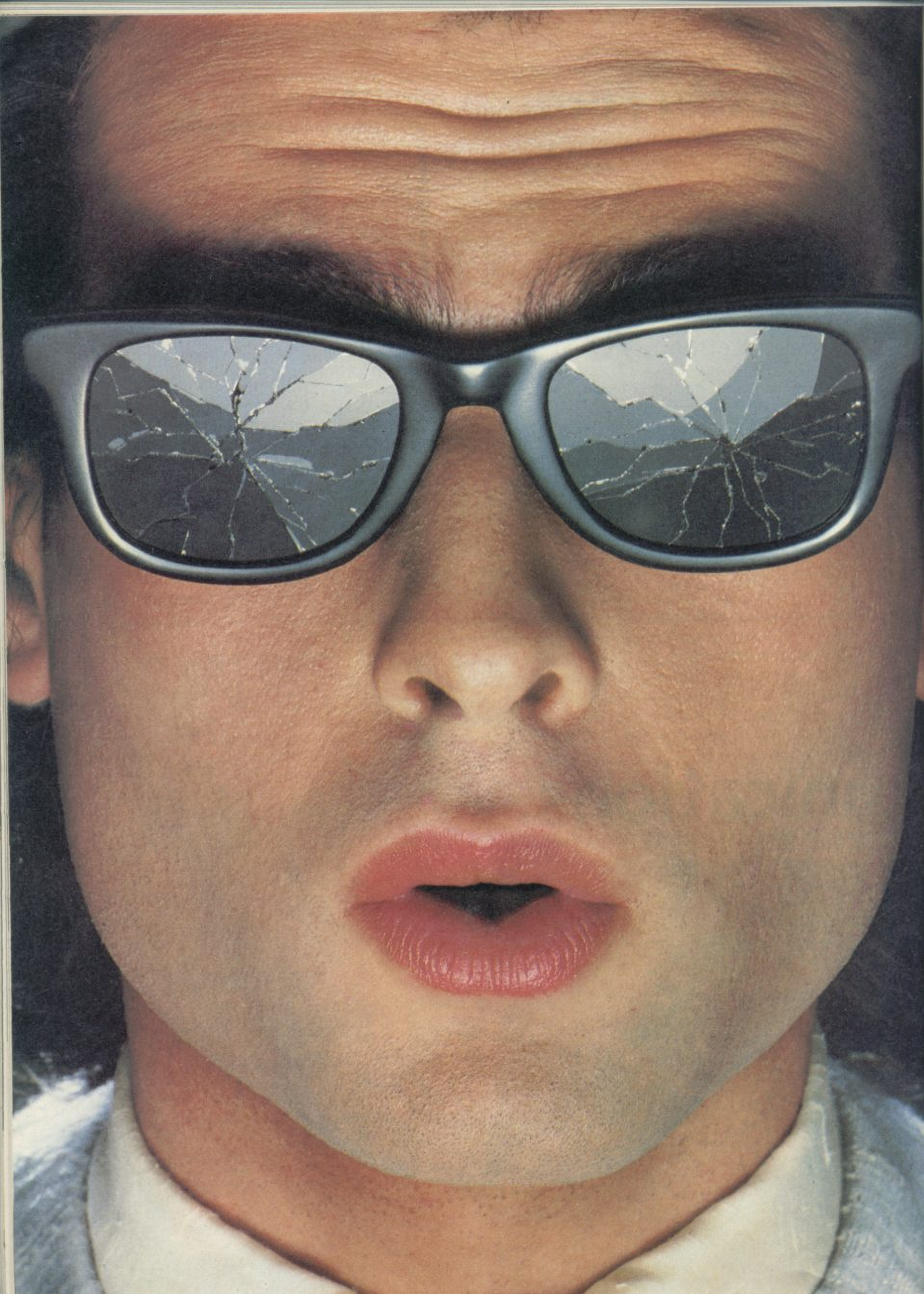
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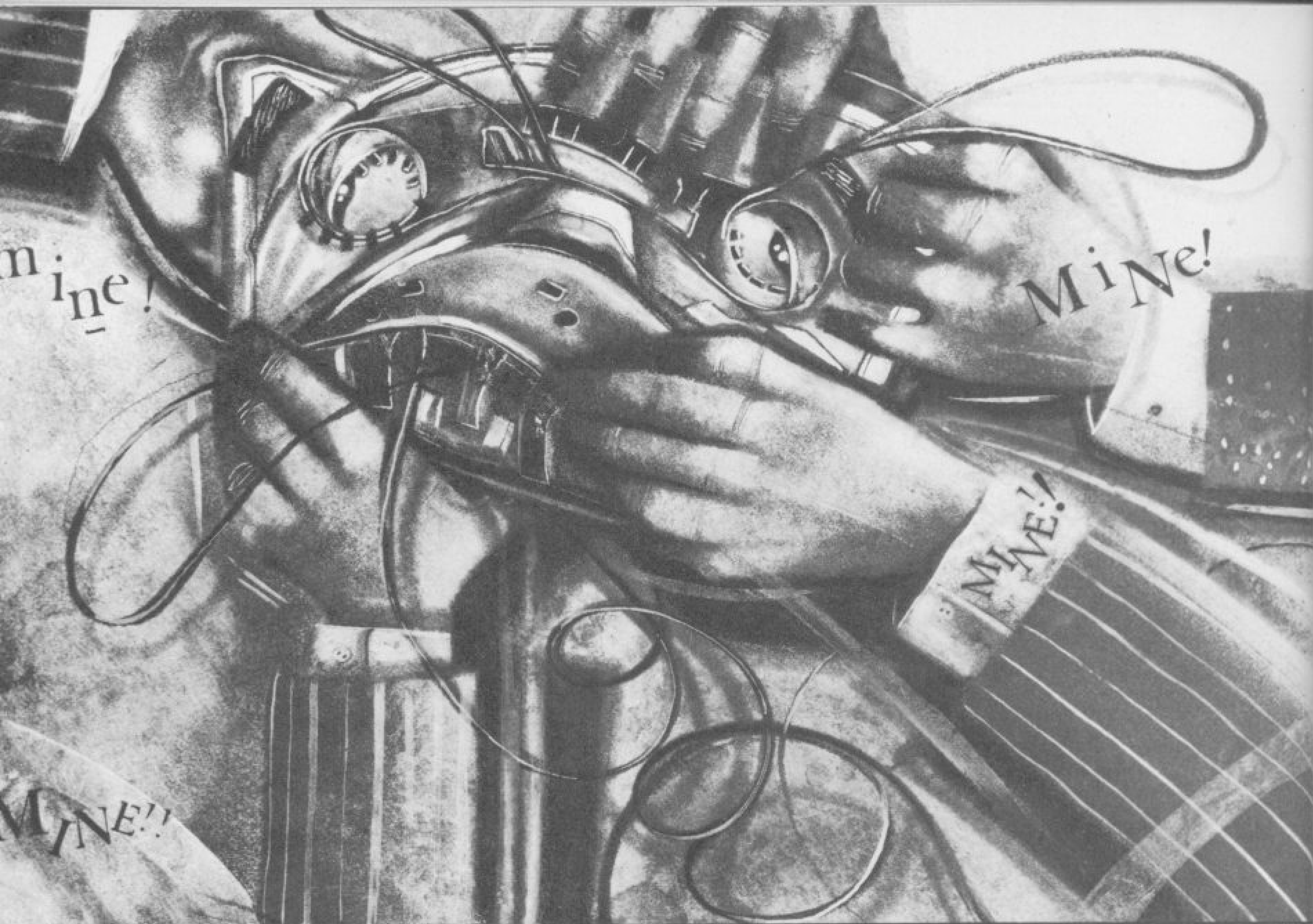
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The great software chainstore massacre

The double dealers of the software industry would fit well into a thriller plot. *Sinclair User* investigator Clare Edgeley reports on their shady world

YOU'VE READ the ads, you've seen the charts, now buy the game. Load it up and . . . oh — it's just another piece of junk software to add to the growing pile at the bottom or your wardrobe. Disappointed? Tough, you've been conned again. Still, it's only another £6.95 down the drain. Better luck next time.

If the above rings true then you are likely to be discontented with the way that software is distributed and marketed today. You are not alone; the software houses themselves are less than happy too, and some of them will not be around much longer to register that dissatisfaction.

Background

The last eighteen months has seen a dramatic and potentially dangerous change in the software industry. At one time there was room for everyone and games of all qualities sold well. Control has now passed out of the software houses and into the hands of the distributors who, theoretically at least, are more discerning in what games they handle and are buying games in smaller quantities to avoid a glut of stock after the christmas period.

If software companies want to get their games into multiple stores such as W H Smiths and Boots they have to go through distributors like Websters and Terry Blood, whose job it is to ensure that the games reach the maximum number of retail outlets possible.

Life was not always so complicated. Around two years ago, the bulk of games were bought through mail order where, as Andrew Hewson of Hewson Consultants states, "You put your money in the post and kept your fingers crossed for 28 days". Nowadays, games have a long and complicated journey to travel before they reach you, the end user.

Once a piece of software has been produced, the software house needs to get it into the shops as quickly as possible. In most cases an advertising campaign announces the arrival of the game and review copies are sent out to both distributors and the computer press.

The distributors attend regular fortnightly meetings with the larger stores to present the new releases. However, many software companies contact the

store buyers direct, enabling them to look at a new range of games before meeting the distributors. In that way the buyers can get a rough idea of the games they wish to purchase.

The middlemen

Though distributors succeed in achieving phenomenal sales for some products, not everyone is happy with the way in which they go about it. Michael Howard, from the London-based Buffer Micro Shop comments, "dealers and distributors haven't been discriminating enough and second rate software has flooded the market. It has degraded the whole software scene."

The criteria used by the distributors is not purely based on the quality of the software. "I prefer to see all the games first to make sure that the standard of programming isn't slipping", says Stephanie Thompson, buyer at Boots, "I won't take on a game unless it has a minimum of three months healthy shelf life". Educational software, for instance, is a notoriously difficult product to get past the middlemen.

Various other factors affect a game's chance in the race to the shop shelf. Both buyers at W H Smiths and Boots agree that packaging is very important and that games should be presented in the most compact form. Games in large format video style boxes, such as the Level 9 adventures, are thus at a disadvantage to begin with.

Anything out of the ordinary is also difficult to market. Software house Craig Communications discovered that when it launched **System 15000**, a game which is all about hacking and one which could take months to break. "Many distributors were very hesitant in taking it on as it was so different and didn't fit into a specific category", says David Giles of Craig.

Fortunately, **System 15000** was well received by the computer press and also had coverage in the *Sun*, *Mirror* and *Daily Mail*. The amount of coverage the game received helped in persuading the distributors to carry the game.

In general, the smaller, maverick, software publishers are less happy with the situation than the larger companies, such as Ultimate and Melbourne House, who are guaranteed sales and are happy to toe the distributors' line. Andrew Hewson for instance, believes, "The distributors are doing a great service to the buying public. At the moment the dealers demand a good margin to protect themselves against bad games, but I believe that their percentages will eventually drop".

Those margins — often as much as 60 percent — can, however, be crippling for small companies.

Slice of the cake

As in all cases, the middleman has to be paid. The distributors demand a huge discount when taking on a game, part of which they keep as their fee with the remainder going to the retailer.

Distributors operate on a credit system and normally pay for a game 30 days after ordering it. However, many are experiencing cash flow problems and it is rumoured that some demand as much as 60 days credit.

There is no way that many software houses can accept those terms and many have vanished from sight in the last few months. Clement Chambers from CRL believes that by next year as many as 50 percent of the software houses will have disappeared, for a variety of reasons.

Automata is a relatively small company and has recently produced the unusual **Deus Ex Machina** which gained unanimously excellent reviews in the computer press. Despite that, the game is getting nowhere.

Automata refuses to meet the distributors' demands for credit and request payment with order. In the past the distributors have complied with this request due to public demand for the Pi-man games. Christian Penfold is furious: "The sales of **Deus** are absolute rubbish — our total sales from 6 September to 26 November 1984 were 4550, including 86 through mail order".

That is largely due to distributors suffering cash flow problems and refusing to take on large quantities of the game. At the same time, Automata cannot afford to give credit on large orders as they have to pay their staff and everyone connected with the production of the game. "The distribution to independent retail outlets is non-existent", continues Christian. "We did have trouble getting into Smiths although in the end Terry Blood and Thorn EMI took small quantities".

Joe Wood from Terry Blood comments, "The game has a high unit price but the dealers get too low a profit. The margin has prevented it getting such a wide distribution amongst dealers".

Automata is adamant that small software houses such as themselves are being squeezed out of the market by large companies with financial backing, who can afford to meet the distributors' terms and are prepared to make 'colossal losses'.

The alternative

Nick Alexander, from Virgin Games, believes that at the end of the day a large company will survive longer but there might not be any point in going on if there is no money to be made. "We have been arguing for a long time that distributors have too much power. This year they are demanding more margins on longer payment terms than in the past and the industry is having to give in."

Alexander is not prepared to take that lying down, and in his capacity as chairman of the Guild of Software Houses, is trying to discourage that trend. GOSH has formed the Software Sales Service which acts for Bug Byte, Quicksilva, Ariolasoft, Virgin and CBS in a planned move to cut out the middlemen.

The sales team will sell direct to the retail outlets and CBS will act as the manufacturing plant to stock and distribute the games. It is hoped that with GOSH acting separately, they will be able to take a firmer line in negotiations with the distributors.

One solution to the problem would be to appoint a small number of distributors to act for the software industry, considerably reducing their numbers which stand at present around 50. They would receive a smaller discount but would be handling more software.

Who reads reviews?

On the whole, software houses, distributors and retailers all agree that good reviews can push up a game's sales whereas bad reviews can cause a lot of damage.

CRL believes that a bad review can affect sales of a game by as much as 25 percent. That is not, however, borne out in the case of **War of the Worlds**, where luke-warm reviews did nothing to prevent high sales of the game.

Automata, on the other hand, does not place as much reliance on reviews, though admits that good reviews can persuade distributors to handle games.

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Some games with short shelf lives, such as Thor's **Jack and the Beanstalk**, are in and out of the charts before the damning reviews are even in print. The overnight success of such games is due to the added ingredient 'hype'.

Hype

Advertising, more than anything else, will help to sell a game. At sometime or another most of you will have bought a game which has been hyped through the advertising media. It does not necessarily follow that a heavily advertised game is going to be good. The fact remains, however, that a game that is advertised well enough will sell.

A strong advertising campaign also brings the game to the notice of both distributors and reviewers. Large software houses can afford to spend vast sums on advertising but the smaller ones cannot. Consequently a brilliant game may not sell as well as a poorly programmed game which is extensively hyped.

Geoff Brown, from the distributors Centresoft, expects games to be sent to him for evaluation prior to acceptance, although "If a game has been heavily advertised I would have to stock the game even if I didn't receive a review copy. The advertising would have created a demand and the dealers will often want to buy it."

You can only buy what you see and read about. If a game is not available in the shops it is forgotten and quickly fades from sight. **Deus Ex Machina** might be one such game, whereas **Monty Mole** from Gremlin succeeded for reasons which had little to do with the quality of the game.

According to Ian Stewart of Gremlin, **Monty Mole** was "a poke at Scargill" and had a lot of coverage from the press as well as being featured on *News at 10*. "We didn't aim to get adverse publicity, even though that can be beneficial. It was just as well the miners' strike continued or we would have fallen flat on our faces."

Criticism of hype comes from Clement Chambers of CRL, somewhat strangely considering the promotion that went into **War of the Worlds**: "Too much money is being spent on huge advertising campaigns and there is a lack of business sense and aggressive selling". Chambers does not believe in spending money on a lot of advertising and puts his faith in good reviews and sales promotions.

The charts

The charts are another area in which games can be hyped. There are two kinds of charts, one based on the quantity of games brought from a wholesaler and the other based on the number of games sold through shops.

However, there are occasions when a game enters the charts under false pretences. It is rumoured that in one case 800 copies of a game were sold to a dealer at half price. The dealer effectively bought 400 copies and received 400 free — the game jumped to the top of the charts.

And there are cases when genuine mistakes are made. **Ghostbusters** on the Spectrum entered the charts of a well known weekly magazine at number 4. That was before the game had even been released! The mistake was due to the game entering the charts at number 4 on the Commodore 64 and being placed in the same spot on the Spectrum chart.

Whatever the reasons for games reaching high chart positions, it nevertheless has a healthy affect on sales.

Budget software

"Hype is useful — if you hear enough about a particular product, you will return to have a look at it in the end", says Colin Stokes of Software projects talking about the range of budget software marketed under the name of Software Supersavers.

Producers of budget software, along with everyone else, are experiencing great difficulties getting their ranges onto the market through distributors. Stokes repeats the general view that the problem lies in the vast amount of software on the market and the fact that some distributors are wary about accepting the ranges due to the low profit margins involved.

To get round the problem Software Projects has decided to bypass the distributors and are attempting to market the range themselves by dealing directly with the dealers through a sales team. The £2.99 price has been lowered to £1.99 to compete with the Mastertronic range.

It's up to you

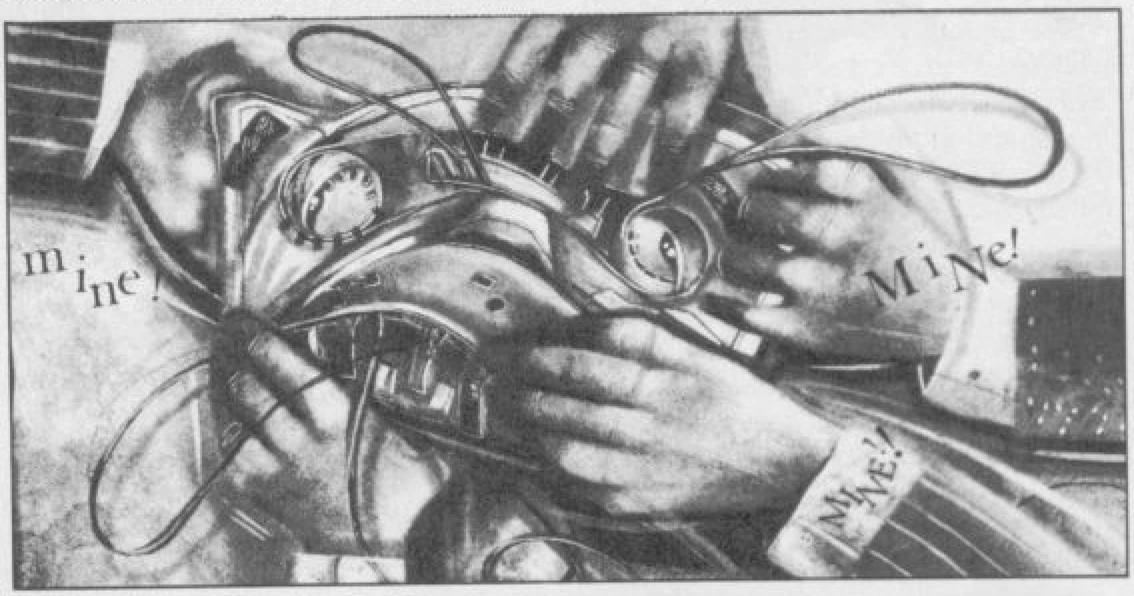
There has long been a glut of inferior software in the shops and there are few signs that this will change. At present the people least capable of judging the worth of software — the distributors and dealers — are deciding what will appear on the shelves. Of course, the software industry has to a great extent brought this upon itself in its attempts to make a fast buck with poor programs. The smaller houses are suffering the consequences.

What can you do about it? The entire industry has one objective: to make you buy software. If you stop buying games because they are just not good enough then the industry will have to change its tactics.

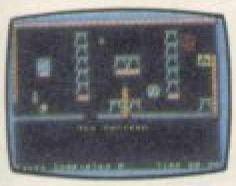
The next time you buy a game which does not live up its promotional blurb, complain. Write to *Sinclair User* and warn other readers. Write to the software house and explain why you will not be buying any more of its products.

More importantly, if you cannot find a particular game which has received favourable reviews, pester your local shop until the staff agree to order it. Contact the publishers and get them to bring pressure to bear on the distributors. Complain to the head office of the retail chain in question.

Above all, don't be content with the second rate. There is enough of it around already. Don't buy it — it only encourages them.











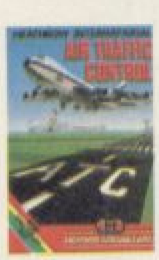
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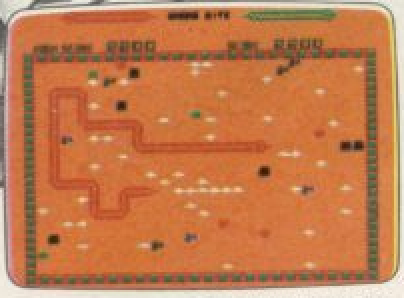
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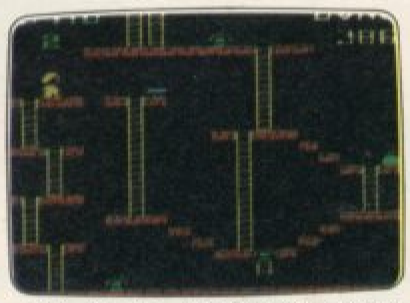
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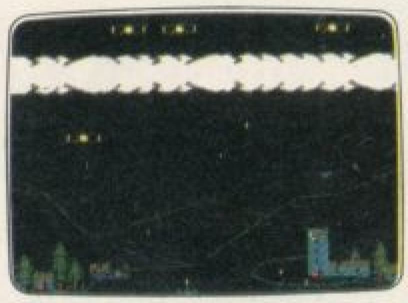
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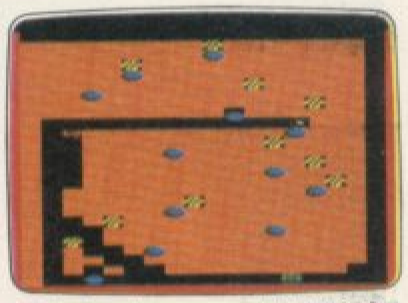
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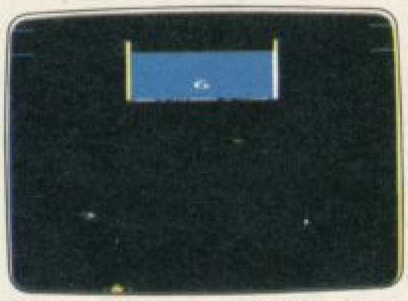
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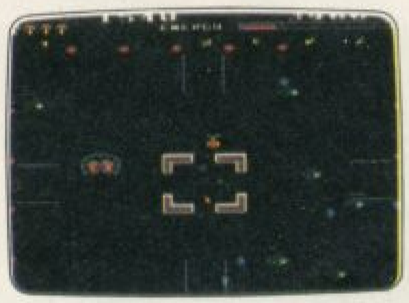
004 Arcade BBC MICRO B
GOLD DIGGER – The hazards of digging for gold down under.



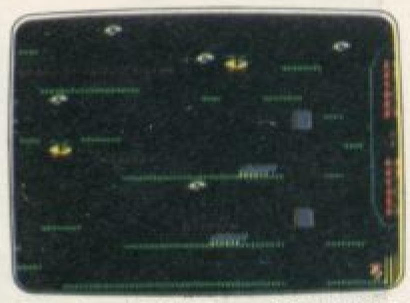
005 Arcade BBC MICRO B
DUCK! – Comedy and music in this duck shoot.



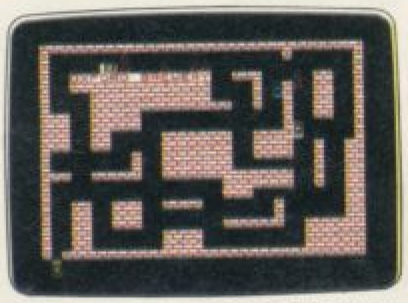
013 Arcade BBC MICRO B
ACID DROPS – Fly through to tackle the mutant spinners.



022 Arcade BBC MICRO B
ESTRA – Recover the sacred statue of Estra the snake god.



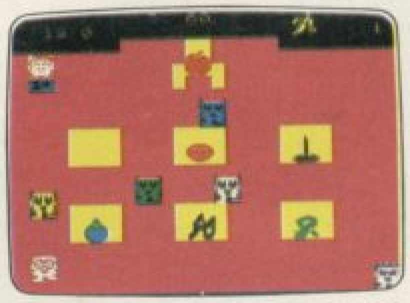
023 Arcade/Strategy BBC MICRO B
THE HACKER – Terminal to modem, telephone network to mainframe.



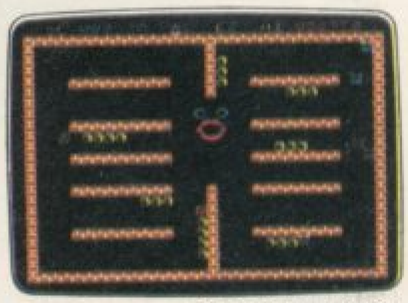
006 Arcade SPECTRUM 16K/48K
RUN BABY RUN – Multi-car cop chase and shoot-out.



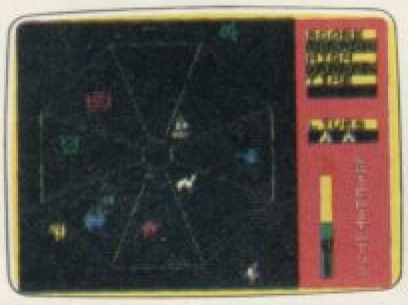
009 Arcade SPECTRUM 16K/48K
TERRA FORCE – Terra man defends earth against all odds.



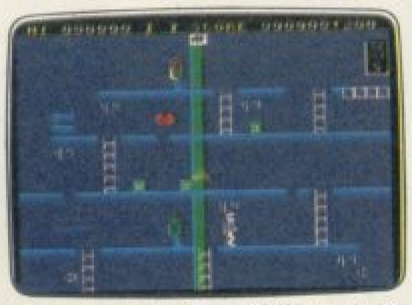
010 Arcade SPECTRUM 16K/48K
MENACE – What happens when teacher turns his back.



021 Arcade SPECTRUM 16K/48K
CRAZY CAVERNS – Ten crazy caverns, ten hungry mouths to feed.



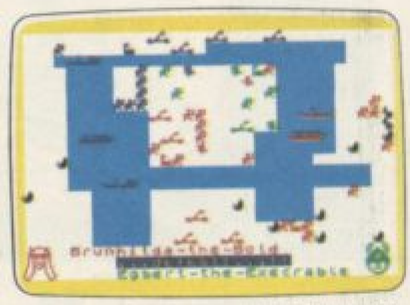
007 Arcade SPECTRUM 48K
EXODUS – Strange creatures emerging from the pits.



014 Arcade/Strategy SPECTRUM 48K
MR. FREEZE – Six compartments, each tougher to de-ice.



016 Arcade Adventure SPECTRUM 48K
BOOTY – Twenty holds crammed full of pirate loot.



008 War Game SPECTRUM 48K
VIKING RAIDERS – A test of strategy against the computer or friends.

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Datapen

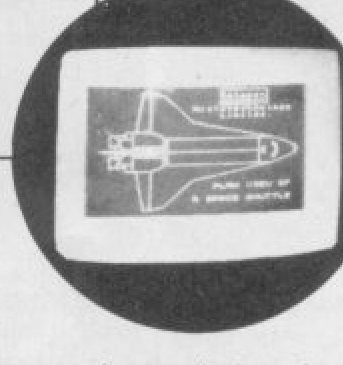
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for use with the SPECTRUM computer

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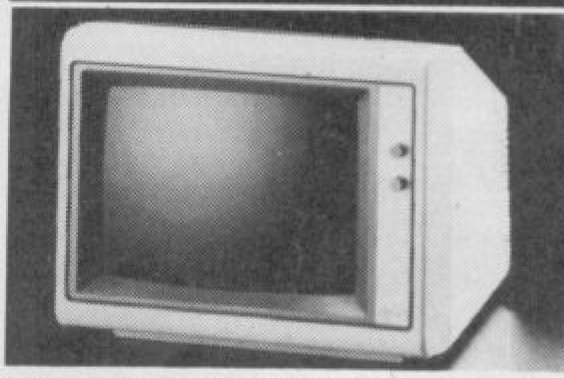
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Kaga/Taxan black and green	£99.95
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All the software we supply runs on full-size printers (unless you are using interface 1) you will require an interface to connect your Spectrum to a printer, the interface we supply uses the graphics characters to set printer codes as in Tasword and prints a double size screen dump.

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BARCLAYCARD VISA

Mike Wright examines the advantages of the McGraw-Hill small business suite

The profile of peak performance

This month *Sinclair User* is offering a special deal on a package of four programs from McGraw-Hill. The package is **Spectext,** a word processor, **Profile 2,** a spreadsheet file handling program, **Projector 1,** a business graphics package, and **Electronic Diary.**

The most commonly used part of any business type package is the word processor. Consequently it should be powerful while being easy to use. Usually there has to be a trade off between the two otherwise the program would use the whole of memory with no room for the text.

There is no doubt about the power of **Spectext.** It consists of three parts: Spectext, Specfile, and Specmerge. Specfile is a simple card index database for names and addresses and Specmerge is a program which allows you to insert the names and addresses from Specfile into a standard document produced by Spectext.

It also has all the usual features for entering text, deleting characters, inserting, block delete and block move, and save and load. Text can be printed with page numbers, margins and double spacing from the start or even from a specified line.

The manual is stored as two text files on the other side of the tape and those need to be loaded, read and printed — if you want something handy to refer to — before you begin. On a ZX printer the first of those uses about eight feet of paper.

The program is run from the main menu which has eight options: enter text, load text, print text, read edit text, save text, reorganise, switch printers and a microdrive catalogue. Unlike most word processors text is entered at the cursor at the bottom of the page and scrolls upward. When entering text you are given no idea of what it will look like at the end. Text is added in one continuous stream with new lines, paragraphs and pages being denoted by a graphics character. Those are inserted into the text by pressing Enter followed by 1, 2 or 3. Entering 'z' takes you back to the main menu and Enter on its own puts you straight into option four of the main menu — "edit text".

If after you have been editing your text and decide to enter some more, selecting Enter text from the main menu gives you a clear screen as if no text had previously been entered. However new text will be added to the end of the old text.

The Edit text option allows you a wide range of functions which will delete text in a block, add text at the cursor or print from the cursor to the end of the text. You can also search for any string and replace it with any other. Blocks of text can be moved around using the move option, although the method used is awkward since it involves deleting the text first. The move option inserts the last piece of text deleted at the cursor.

Selecting Edit text displays the end of the text with a message line showing the page number and the number of characters left which can be used. Text is deleted by positioning the cursor under the first letter to be deleted and pressing D moving the cursor to the last letter and pressing D again. Text can also be added at, or printed from, the cursor by pressing 'a' or 'c'. To use the other options the 'z' key must be pressed. That gives the prompt 'type?' which allows text to be added at the cursor. Pressing Enter changes the prompt. When the required option is displayed enter 'z' again to select it.

Although the text shown on the screen has words straddling lines, no obvious margins or paragraphs and graphics characters dotted throughout, it is formatted when printed. The number of characters per line, lines per page, left margin setting and the number of blank lines between pages are set in the reorganise option prior to printing.

Spectext prints happily on the ZX printer but if you want to use a full size printer you will need to exercise care. The switch printer option and the documentation both lead you to believe you need to use that option for a full size printer. I tried it with my Tasman interface and it hung completely. I then tried printing without it but simply using reorganise to set an 80-column width. It worked perfectly.

The database Specfile lets you set up records with up to 15 different fields, each field a maximum 23 or 25 characters. The number of fields, fieldnames up to 10 characters, and the length of each one must be set up at the start and then cannot be changed.

Once the structure of the database is set the records can be entered. For each record a list of the fields is shown and you are prompted for the entry. Confirmation must be given at the end of a record that is correct. Once entered the records can be sorted on any field except the last. You can search the file for any string of characters and then once a record is on screen edit it, copy it or simply search for the next record with the string in it by entering 'z' when the option is shown.

Specmerge, the third program, is easy to use. The draft letter is set up in Spectext with the variables being represented by a number between two arrows, such as ›3‹, and saved. The numbers correspond to the field numbers in Specfile. Once Specmerge is loaded the document is read in first followed by the database and the field variables are merged. The results can be printed to the screen or printer.

```
^1^. ^2^ ^3^,-^4^,-^5^,-^6^,-^7^

---Dear ^1^. ^3^,--[Your subscri

ption to ^8^ is due to expire on

 ^9^.[I hope you have enjoyed re

ading ^8^ and that you intend to

 renew your subscription. As a l

ong and valued customer I can of

fer you a further discount on re

newal. A voucher is enclosed.[[

                              Yo

urs sincerely[[[[[[

                    Doreen Gudre

ad (Mrs.)
```

Spectext letter on screen

At £13.95, **Spectext** offers the most powerful word processor available as a single program for the Spectrum. However, that must be balanced by the fact that it is impossible to see what you are ultimately going to end up with typing in text. In fact it will probably take several tries at printing to the screen and re-editing before you are happy with the results.

Not being able to use the program from microdrive is a major mistake for any word processor that wants to be taken seriously. However, McGraw-Hill do offer an upgrading service for purchases of the cassette, providing a microdrive version for a minimal handling charge.

The idea of combining some of the best features of spreadsheets and databases into one program is clever. **Profile 2** simulates a large sheet of paper divided into rows and columns. The columns are given fixed headings corresponding to fieldnames in a database, where the rows are the records.

Like Specfile the fieldnames (up to four characters), their width (between four and 28 characters), type (character or numeric) and number of decimal places (up to four) must all be set at the start and cannot then be changed. That is done in a short program which is loaded before the main one.

When the main program is loaded a clean sheet of paper stretches before you waiting for your entries. The field names are shown on the top line of the screen and the bottom line is used to show the first 31 characters of the row. Movement around the spreadsheet is done using the cursor keys as normal. Faster movement is achieved by moving a field at a time using the odd combination of Caps Shift with 2 (left), 3 (down), 4 (up) and 9 (right).

Once your records have been entered you can begin processing using a 12 option menu. The menu is reached by pressing Caps Shift and 1 and lets you insert and delete records, which can also be protected by 'locking' them against overwriting. Numeric fields can be checked to see that they contain sensible information and can also be totalled. The totalling can also be done for a conditional selection of records. Another option is used to indicate the number of records already used and the maximum left in the database.

The most powerful features of **Profile 2** are held in the three options print, find and replace. The find option searches for records that are specified by a conditional statement. The conditions are similar to those used in Basic — equal, greater than, less than, AND, OR, NOT, and so on. When a record is found it is displayed on screen in the same format as used by the view option.

The print option allows you to print all or some records. A conditional statement of the type 'fld1=McGraw' is used to select the records. After you have decided which records to print you are given the opportunity to design the layout of the printed report by stringing together a series of fieldnames, text in quotes and N$ for newlines with + signs. String slicing can also be used to print part of a field.

The replace command allows you to replace the data in all or some of the records with new data which is determined by specifying it as a function of the fields. For example, if you keep a price list on it and prices from a supplier increase by ten per cent, then prices can be updated by supp="McG" followed by pric=pric*1.1. Strings can also be sliced and concatenated as part of the function.

Profile provides a nice compromise between the spreadsheet and database and is surprisingly easy to use, despite not being very user friendly. No indication is given on screen as to how the commands can be reached and the menu lists a string of letters without a description of their function. Because of the format there has inevitably been a trade off in power but the more I used it the more I liked it.

Profile 2 is compatible with microdrive storage in that the cassette is only required with designing the file. Once you have set the file format, successive generations of file and data can be stored on cartridge.

The most exciting and probably the most powerful program of the three is **Projector 1** — the Business Graphics system — but it is not without its problems. It gives you the facility to enter data in six different ways, either as ordinary numbers, as pairs of numbers or in a calendar format (daily, monthly, quarterly, years).

Once entered the data can be displayed as a line graph, pie chart, or histogram. However its features and facilities do not end there. Graphs can be plotted as points or line graphs, with or without a background grid. More power features allow you to fit a line or curve to the data and even to obtain possible projections.

A further feature allows you to build up a presentation of graphs and charts. These can be interspersed with text slides which consist of up to six lines of enlarged text with as many as 21 characters per line.

Before the main program is loaded a

continued on page 124

```
Miss. Carole Reynard,
Flat 2a, Guildford Mews,
Basingstoke,
BERKS,
BA7 5TO
Dear Miss. Reynard,

     Your subscription to Cross Compiled is due to expire on 17
November 1984.

     I hope you have enjoyed reading Cross Compiled and that you
intend to renew your subscription. As a long and valued customer I
can offer you a further discount on renewal. A voucher is enclosed.

                                        Yours sincerely
                                          Doreen Gudread (Mrs.)
```

Spectext letter after printing

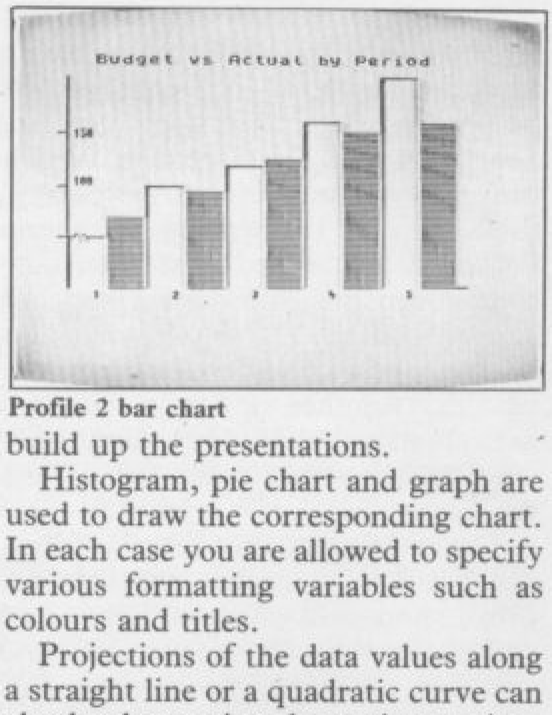
continued from page 123

short program lets you prepare to use one of five preset interfaces, the ZX printer or to load your own printer software. You might encounter difficulties with Tasman option.

The program is run from a main menu offering the following: new data, modify/view data, histogram, pie chart, key points, project, graphic image, build/modify presentation, play presentation, save data, load data, directory and stop.

The best place to start is the directory option which allows you to view what has been created and to debate some or all of the items. It also shows how much free space is left. If you have opted for one of the printer ports you could have a problem here as you are warned to leave at least 300 characters free otherwise the data will overwrite the printer software. That means regular checks on the directory when working on a presentation.

Selecting view displays the items which have been created giving each a reference number made up of a letter and a number — for instance, g3 is the third graph created and k10 is the tenth key point screen — the type and its name. The references are used to



Profile 2 bar chart

build up the presentations.

Histogram, pie chart and graph are used to draw the corresponding chart. In each case you are allowed to specify various formatting variables such as colours and titles.

Projections of the data values along a straight line or a quadratic curve can also be done using the project option.

Building a presentation consists of creating a series of slices made up of graph, chart and key point references, giving it a name and specifying whether each slide will be automatically displayed after a set time or changed manually. The number of times the demonstration will be run can also be set. After that the presentation can be run by the play presentation option after specifying the name and whether it can be stopped in mid-stream.

Projector 1 has tremendous potential for business use and is relatively straightforward to use. Using STOP — Symbol shift and A — to move from entering data, or setting up the charts, to drawing them is inconvenient and if a large amount of data is used it seems slow when preparing items although there is no delay when a presentation is done. At times it also seemed sluggish in responding to entries at the keyboard when typing in titles. Those do not detract greatly from its usability.

McGraw-Hill will be providing an upgrade service similar to that for **Spectext** when the company is confident of supplying reliable microdrive versions.

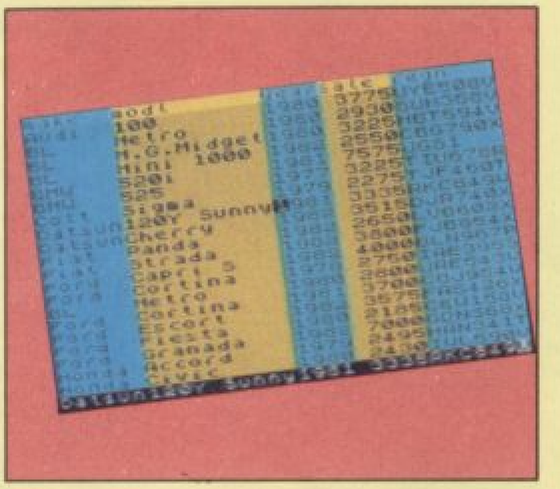
SPECTEXT
Memory: **48K**
Price: **£13.95**
Gilbert Factor: **7**

PROFILE 2
Memory: **48K**
Price: **£13.95**
Gilbert Factor: **6**

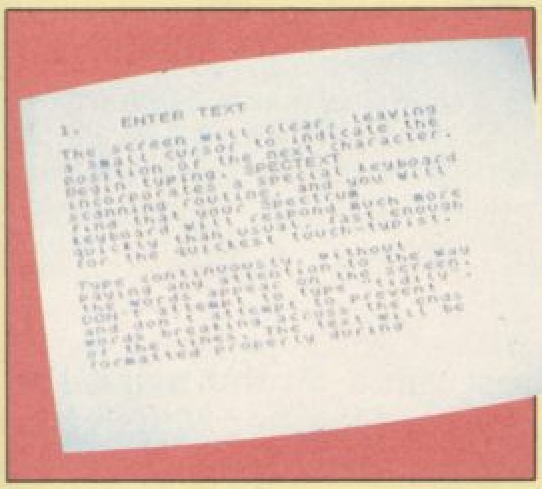
PROJECTOR 1
Memory: **48K**
Price: **£13.95**
Gilbert Factor: **8**

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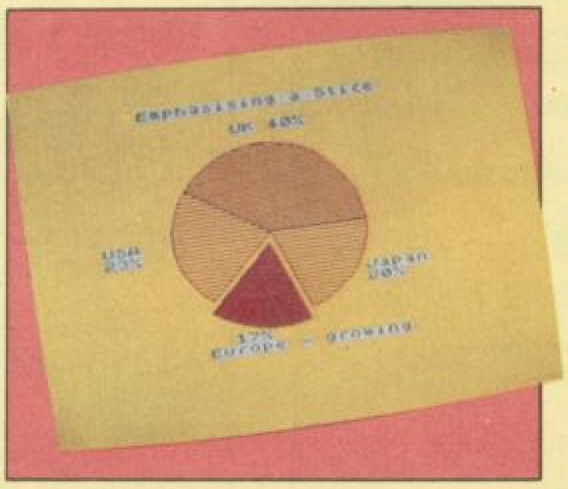
Spectext is a powerful word processor, with a full range of editing facilities, including Move, Search, Replace, Insert and Edit. Text can be printed to any width from 10 to 255 characters, and all files can be saved to microdrive or cassette. The suite of programs also includes Specfile, which allows you to save small groups of text such as addresses, and a Merge routine to transport such files to a main Spectext file, to produce, for example, personalised mail with standard letters.



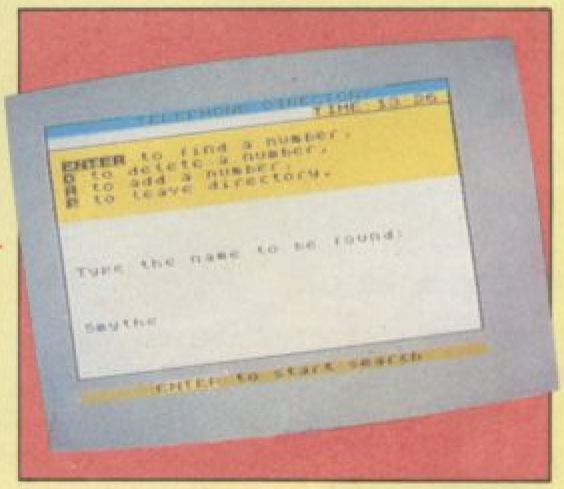


Profile 2 is a spreadsheet filing system. Search routines allow you to find any combination of words and numbers in the file, and the program will sort records, display totals and perform calculations and text changes to the data. Again, all data can be transferred to microdrive or saved on cassette.

Projector 1 is a business graphics package of enormous power. It offers the facility to produce graphs, histograms, pie charts and accompanying text to a variety of specifications. You can hook several displays together to form a presentation display which will run automatically through up to 50 full-screen illustrations. It will even fit a curve to your data and project it for forecasts.



As a suite of business programs, the three provide a firm basis for any small business or home professional operation. But we are also offering an extra program, the new McGraw-Hill **Diary** package. It allows you to record appointments and messages for any day up to the year 1999, and uses a 43-column character set for extra space on the screen. The main display shows a continuous digital date, and the program will search for either a specific date or appointment. It will sound an alarm on specific dates if you so desire, and has built in auto-save for cassette or microdrive.



The full price of all four programs would normally be at least £50, but we are offering them as a package at £29.95 inc p&p. Cheques should be made payable to *Sinclair User* Magazine, and addressed to *Sinclair User*, McGraw-Hill Special Offer, Priory Court, 30-32 Farringdon Lane, London EC1.

Send to: **Sinclair User, McGraw-Hill Special Offer, Priory Court, 30-32 Farringdon Lane, London EC1.**

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Which Micro Spectrum Handbook ☐

I enclose remittance of £...... at £4.99 per book, made payable to EMAP Books.

Name ....

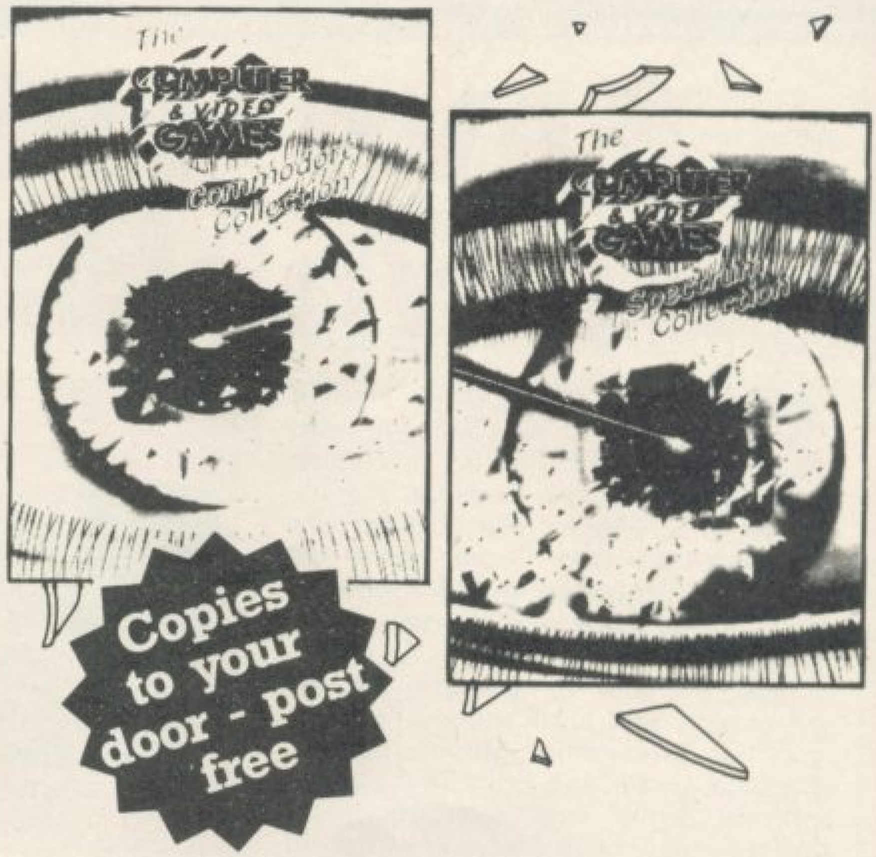
Address ....

....

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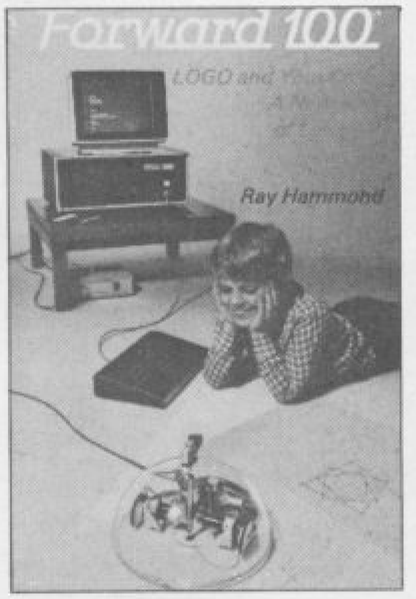
Forward with Logo

A NEW BOOK aimed, as its author Ray Hammond states, at parents and teachers is *Forward 100, Logo and Your Child*.

The main thrust of the book is a review of the current state of Logo in all its manifestations. Ray Hammond works in two ways, as personal commentator, and as reporter. He is demonstrably better as the latter.

Hammond as commentator makes sweeping statements about the teacher's role in the transmission of knowledge. He argues that the teacher is now redundant as the computer has taken over the role. He neatly sidesteps the issue of where all those computers are to come from by suggesting that the children will provide the computers. That presumes that not only will the majority of children have computers, but also that it is possible for a child to carry computer, monitor and all the necessary paraphenalia to school every morning.

Teachers are not likely to be pleased by some of his more trenchant comments either; for example, "The computer is an invention of such staggering, global importance, than any teacher who demands 'training' in the subject, as if the machine were a new video system, reveals a pathetic lack of interest in his or her own career, in the children and a profound ignorance of world affairs."



Hammond as reporter, however, is an entirely different beast. The greater part of the book is taken up with the history of Logo, the different systems available, explanations of the turtle and includes many 'turtle tips' which would be of use to the practitioner.

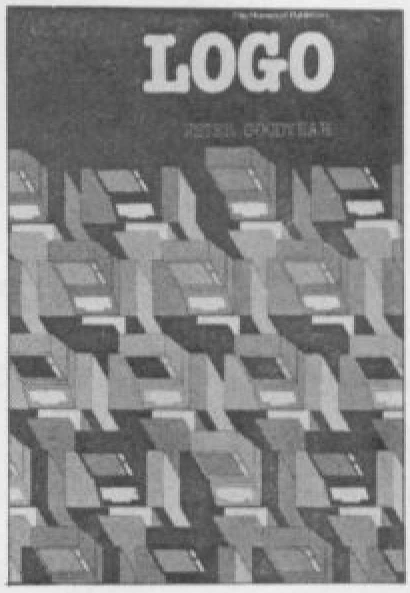
There is also an examination of the two differing philosophies which underly the use of Logo, exemplified by Seymour Papert of MIT and Jim Howe of Edinburgh University. That is backed by extensive quotations from both sides, so it is possible for the reader to weigh up the evidence. A reasonably large section deals with case histories from both researchers and teachers in the classroom, which gives a greater insight into how Logo can be used.

At £12.95 *Forward 100* is not cheap. There will no doubt be other books which cover the same ground at less expense.

One such book is Peter Goodyear's *Logo, A guide to Learning Through Programming*.

Goodyear differs from Hammond in his approach in that a far greater proportion of the book is devoted to introducing Logo to children.

Projects using the floor turtle are discussed, as well as useful procedures which can illustrate the power of Logo. Goodyear is very strong on the philosophy behind Logo in his chapter Logo in Context, and also covers research projects in the same way as Hammond.



Where Goodyear differs is that his tone is less prone to lapses of personal commentary. He uses a universal Logo for his examples which differs in some respects to Sinclair *Logo*, however an appendix shows the main differences between Apple, RML and other Logos. Since Sinclair **Logo** is the same LCSI version as Apple, there should be no problem in adapting procedures for use on the Spectrum.

Of the two books Goodyear's must be considered the better buy, not only on grounds of price but also because of its pragmatic approach.

Theo Wood

Forward 100, Logo and Your Child, A new way of learning
Publisher: **Viking**
Price: **£12.95**

Logo, A Guide to learning through programming.
Publisher: **Ellis Horwood**
Price: **£6.50**

Algebra a la carte

MATHS TUTOR for the Spectrum by Robert Carter takes an unusual approach to the problem of tackling computer programming.

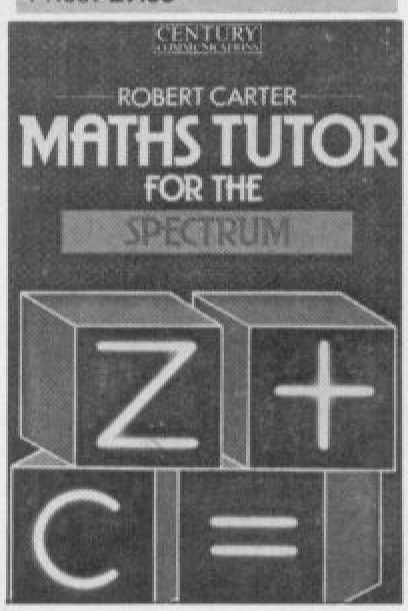
One of the main difficulties for people writing their own programs is the need to express relationships of shape and movement in algebraic terms. Robert Carter tackles the problem and has produced a highly readable book which starts from the beginning and works up to quite complicated mathematical concepts.

Each step is illustrated by a routine which can be entered on the Spectrum to show the concept working. Obviously those routines could be used later in programs, but by using them Carter has ensured that the reader will understand what the algebraic notation means. The subjects cover the most simple — such as rounding up — to the operation of differential equations. Carter's style is refreshingly colloquial and avoids the trap of being too dry to sustain the reader's attention.

Maths Tutor for the Spectrum would be useful for teachers in preparing classwork, students at examination level and self-motivated adults who wish to brush up their mathematics. It is an excellent introduction to the language of algebra and geometry and as such is to be highly commended.

Theo Wood

Maths tutor for the Spectrum
Publisher: **Century Communications**
Price: **£7.95**



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Rubber numbers in the Spectrum ROM

Computer arithmetic does not always tell the truth. Andrew Hewson makes those recalcitrant digits dance to his tune

OCCASIONALLY I have thought of arranging your letters into a 'Top Ten' of the topics which occur most frequently. The following letter, from Stan Merrifield of Paignton, is on a subject which would definitely figure in the list. He writes: **Just for fun I set up a loop in my Spectrum to print all the integer square roots between one and 100 as follows:**

```
10 FOR N = 1 TO 100
20 IF SQR N = INT (SQR N)
THEN PRINT N
30 NEXT N
```

I felt quite chuffed when it printed 1, 4, 9, 16, but after a slight delay it added 64 and finished. I cannot understand why it missed 25, 36, 49, 81 and 100. What is going wrong?

I first answered a question of this type in the second issue of *Sinclair User* in May 1982 and I have covered it at least once since then. I make no apology for tackling it yet again because, like a bad penny, it keeps on turning up.

It is noticeable that the question always comes from the older sort of Sinclair user. That might be because young people generally have a much deeper understanding than their elders of the rounding errors that occur when the form of a number is changed from one representation to another. For that we ought to thank the Nuffield pioneers who radically altered the Maths curriculum in schools in the late '60s and early '70s.

Those of us who went to school before 'New Maths' was established are familiar with only one example of a rounding error and it is buried so deep in our knowledge of arithmetic that we cannot look at it in an objective fashion without considerable effort. The example to which I refer is that one third cannot be exactly represented by a finite number of digits in the decimal system.

As we all know the following statements are all incorrect: ⅓ = 0.3; ⅓ = .33; ⅓ = 0.333. No matter how many trailing threes we place at the end of the number the result is still incorrect, even if only slightly. We are so familiar with that example that we no longer consider it worthy of comment or investigation. We are no different from the Romans of ancient times who no doubt knew that their system of numerals was cumbersome and slow but were happy to persist with it despite its deficiencies.

Unfortunately, because the decimal representation serves us well in everyday life we somehow assume that the inaccuracy in one third is a property of the number itself rather than the method by which we choose to represent it. In fact it is easy to show that it is the method of representation which is at fault, not the number.

If we had been created with six fingers on each hand rather than five then we would presumably count in groups of twelve, that is we would count to base twelve. When counting to base twelve the following statement is true: ⅓ = 0.4. That is easy to understand if you remember that the column following the point is the twelfths column and four twelfths equals one third.

However, counting to base twelve is not immune to problems. The fraction one fifth, for example, which is equal to 0.2 in the decimal system can only be exactly represented in base twelve by an endless repetition of the four digits 2497, after the point. The crux of the problem is that no matter what base you choose there will always be some fractions which cannot be represented exactly. There even some numbers — π, the ratio of the circumference of a circle to its diameter, is one example — which cannot be exactly represented in any base.

Those inexactitudes do not normally matter because we are happy to accept that a number which is correct to an arbitary number of significant figures is exact for all human purposes. The trick then when writing your programs is to build in acceptance of tiny but irrelevant differences. In particular you should not, as Stan Merrifield has done in line 20 of his program, demand exact equality in any comparison.

It may seem surprising when considering Stan's program that rounding errors creep in because he is searching for whole number solutions only, which can be exactly represented in any base. However, in order to find the square root of a number N the computer converts it to binary 'float-

continued on page 132

ROM ROUTINES

Routine	Dec	Hex	Function
EXPTNUM	7289	1C82	Evaluates in part the numerical expression currently pointed to by CHADD. During syntax-time the routine confirms the presence of a valid numerical expression. In run-time it places the evaluated expression onto the calculator stack, to be fetched by STKTOA or STKTOBC.
EXPT2NM	7290	1C7A	As for EXPTNUM, but searches for two numbers separated by a comma.
NEXT2NM	7289	1C79	CHADD is incremented before jumping to EXPT2NM.
EXPTSTG	7308	1C8C	Performs a similar function to EXPTNUM except that a string is expected rather than a number.
STKTOA	7828	1E94	Fetches the last value from the calculator stack and compresses it into the A register.
STKTOBC	7833	1E99	Compresses the last value on the calculator stack into the BC register pair.
STKFTCH	11249	2BF1	Fetches the various parameters relating to the last string entry on the stack. DE points to the first character of the string whilst BC holds the length of the string.
LOOKVAR	10418	28B2	A search of the variables area is made for the variable whose name is currently pointed to by CHADD. If the variable is found, the carry flag is reset and HL returns pointing to the last letter in the variable name; otherwise the carry flag is set and HL will point to the first letter of the name.
INTSTOR	11660	2D8C	On entry HL points to the first of five locations whose contents are to be stored on the calculator stack.
STACKBC	11563	2D2B	The number currently held in BC is stacked in floating point form.
FPPRINT	11747	2DE3	Prints the last value on the calculator stack. Calling STACKBC and then FPPRINT therefore provides an easy method of printing any 16 bit number.

Table 1. A list of ROM routines concerned with using the Spectrum calculator together with their entry points.

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ing point' form because the calculator in the ROM will only perform calculations on such numbers. Floating point numbers are necessarily fractions and so it is at the conversion stage that the errors occur.

Stan's program will work as planned if the following line is substituted for line 20:

20 IF ABS (SQR N − INT (SQR N)) < .0000001 THEN PRINT N

That discussion about the calculator in the Spectrum ROM leads me into the following letter from Norman Strong of Epsom. He writes: **I am interested in mathematical problems. How can you perform calculations in machine code using logs, powers and trig functions?**

Accessing the calculator in the Spectrum ROM from a machine code routine is very straightforward because it is only necessary to call RST 28h, following the instruction with a single digit code to tell the calculator what you want it to do. The system is designed around a calculator 'stack', a method used by most computers and calculators. Readers who have used one of the range of Hewlett-Packard calculators — which use so-called Reverse Polish Notation — or who are familiar with the Forth programming language will recognise the mechanism immediately.

The mechanism is mostly easily understood by way of an example. Suppose we require to subtract the Basic variable B from the Basic variable A and to PRINT the result. In other words we wish to execute the following Basic statement in a machine code program:

PRINT A−B

The steps are as follows:
1 — use a ROM routine called LOOKVAR to locate variable B in the Basic variables area; 2 — transfer the value of B to the calculator stack using the ROM routined called INTSTOR; 3 — find the variable A in the Basic variables area using LOOKVAR; 4 — transfer the value of A to the calculator stack using INTSTOR. 5 — call the ROM calculator using RST 28h and follow the instruction by a byte containing 03h which is the code for subtraction and a byte containing 38h which is the code to end calculation; 6 — PRINT the value on the top of the calculator stack using the routine FPPRINT.

A stack system is very flexible because any number of items, up to the limit of the size of the stack, can be manipulated in one operation. Similarly any number of operations can be strung together. If you wanted to divide one number by a second, multiply by a third and then find the square root of the result it would be necessary merely to place the numbers on the stack in the correct order and then call the calculator with the codes for division (05h), multiplication (04h) and square root (28h) followed by the termination code (38h).

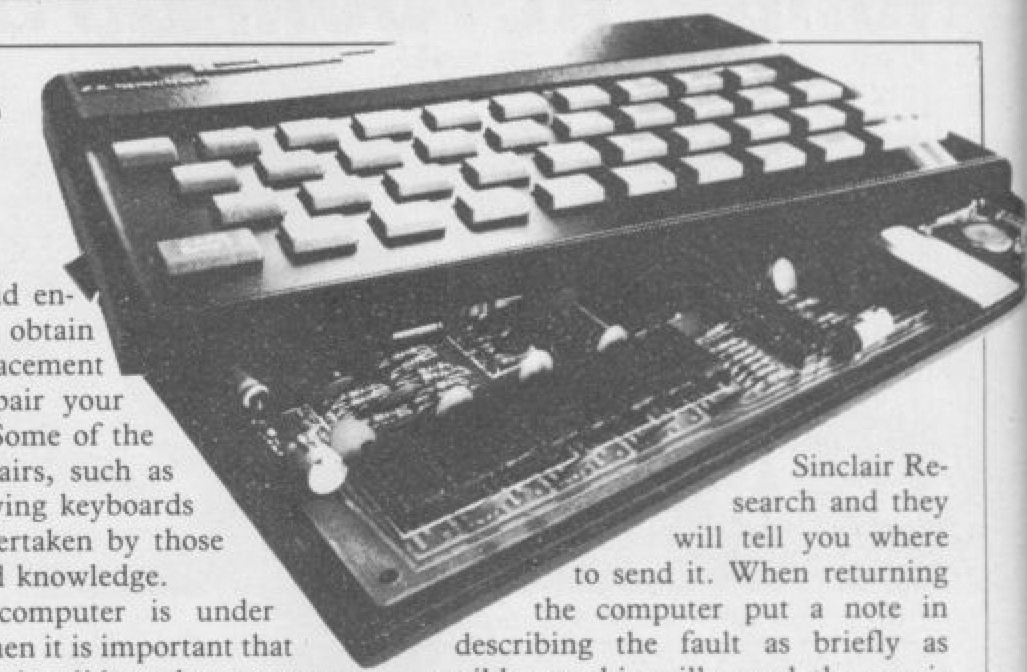
Some of the routines which can be used to manipulate numbers on the stack have been extracted by my colleague Rob Banks, and they are named and described in table one together with their address in the Spectrum ROM. Some of the control codes are listed in table two. Neither table is comprehensive because a full study of the calculator is beyond the resources of this column. The interested reader is referred to some of the specialist books on the Spectrum including *The Complete Spectrum ROM Disassembly* by Ian Logan.

● *Please address problems and queries to Andrew Hewson, Helpline, Graham Close, Blewbury, Oxfordshire.*

Code	Mnemonic	Result (first item)	Result (second item)
01h	SWOP	SECOND	FIRST
02h	REMOVE	SECOND	
03h	SUBTRACT	FIRST − SECOND	
04h	MULTIPLY	FIRST * SECOND	
05h	DIVIDE	FIRST / SECOND	
06h	POWER	FIRST ↑ SECOND	
18h	VAL$	VAL$ FIRST	
19h	USR	USR FIRST	
1Bh	NEGATE	− FIRST	
1Dh	VAL	VAL FIRST	
1Eh	LEN	LEN FIRST	
1Fh	SIN	SIN FIRST	
20h	COS	COS FIRST	
21h	TAN	TAN FIRST	
38h	EXIST		

Table 2. A sample of some of the codes use to control the Spectrum calculator.

Sinclair spares and repairs



IF, LIKE MANY other Spectrum owners, you find one day that your computer has died, you will have a major problem on your hands. Phoning the Sinclair Research customer relations department in Camberley will not help very much either.

If your electronics knowledge is limited, then you will decide to send your Spectrum to one of the companies who specialise in repairing computers. If you have a good working knowledge of electronics then the addresses listed below should enable you to obtain most replacement parts to repair your computer. Some of the simpler repairs, such as those involving keyboards can be undertaken by those with limited knowledge.

If your computer is under guarantee then it is important that you do not invalidate that guarantee. Talk to the customer service division at Sinclair Research and they will tell you where to send it. When returning the computer put a note in describing the fault as briefly as possible, as this will speed the repair process.

Suppliers of Sinclair parts:

Adaptors and Eliminators, 14 Thames Street, Louth, Lincolnshire. (050782) 8011. Spectrum and ZX-81 power supplies.
ASTEC (UK), 16 Albury Close, Reading, Berkshire. (0734) 53067. Supplies modulators for all countries PAL, NTSC, SECAM.
CPC, 194-200 North Road, Preston, Lancashire. (0772) 555034. Supplies all parts for Spectrum, ZX-81, ZX printer, ZX RAM pack including all case parts, power supplies and keyboard parts. Probably the best place to get ULA, ROM, case parts and keyboard.
Ferranti Semiconductors, Computer Road, Hollinwood Avenue, Oldham, Lancashire. (061) 682 6844, (061) 624 0515/6661. Supplies Spectrum and ZX-81 ULA.
Maplin Electronics, Southend on Sea, Essex. (0702) 552961. Supplies general components and data and technical books.
National Semiconductors (UK) Ltd, 301 Harpur Centre, Horne Lane, Bedford. (0234) 47147. Supplies Spectrum RAM/74LS series TTL; LM 1889 video chip.
NEC (UK) Ltd, Block 3, Carfin Industrial Estate, Motherwell. (0698) 73221. Supplies Spectrum ROM and RAM/74LS TTL; Z80A.
Sinclair Research Ltd, Camberley, Surrey. (0276) 685311.
Texas Instruments, Manton Lane, Bedford, Bedfordshire. (0234) 223000, (0234) 211655. Supplies RAM 4116, 4532, 4164, 74LS TTL (Spectrum).
Timex Corporation, Camperdown Plant, Harrison Road, Dundee, Tayside. (0382) 819211. Makers of Spectrum, ZX-81, Printer, Interface one, Microdrives, RAM Pack. Repair and service for Sinclair.
Verran (Computerfix), Units 2H & 2J, Albany Park, Frimley Road, Camberley, Surrey. (0276) 66266. Repairs Spectrums and ZX-81.
Zilog (UK) Ltd, Zilog House, 45-53 Moorbridge Road, Maidenhead, Berkshire. (0628) 39200. Supplies Z80A.

Component companies

SOME OF THE large companies mentioned above do not like dealing directly with the public. The following is a list of component companies which should be happy to deal with you. Most will have catalogues available and will supply data sheets for their products on demand.

These firms are only distributors and they do not make components. If you have a problem with a particular device contact the manufacturer as listed above because not many of the distributors can answer technical questions; RS Components, Farnell, Ambitt and Hawkes may do. Anyone needing NEC parts should phone them direct and ask for some distributors dealing with them.

Abacus Electronics, Kennet House, Pembroke Road, Reading, Berkshire. (0734) 33311. Makes dealt with: National Semiconductors, SGS.
Access Electronic Components Ltd, Austin House, Bridge Street, Hitchen, Hertfordshire. (0462) 57244. Makes dealt with: National Semiconductors.
Alpha Electronic Components Ltd, 66 Wilbury Way, Hitchin, Hertfordshire. (0462) 57244. Makes dealt with: National Semiconductors.
AM Lock Distribution Ltd, Nevill Street, Middleton Road, Oldham, Lancashire. (061) 652 0431. Makes dealt with: Motorola, Mostek.
Anzac Components Ltd, Burnham Lane, Slough, Buckinghamshire. (06286) 4701. Makes dealt with: Hitachi.
Axion Electronics Ltd, Unit F, Turnpike Road, Cressex Industrial Estate, High Wycombe, Buckinghamshire. (0494) 442181. Makes dealt with: Motorola.
BA Electronics Ltd, Millbrook Road, Yate, Bristol. (0454) 315824. Makes dealt with: Texas Instruments.
Celdis Ltd, 37-39 Loverrock Road, Reading, Berkshire. (0734) 585171. Makes dealt with: Motorola, Mostek.
Crellon Electronics Ltd, 380 Bath Road, Slough, Berkshire. (06286) 4434. Makes dealt with: Motorola, SGS, Zilog.
Dialogue Distribution Ltd, Watchmore Road, Camberley, Surrey. (0276) 682001. Makes dealt with: Hitachi.
DTV Group, 10-12 Earnest Avenue, West Norwood, London SE27. (01) 670 6166. Makes dealt with: National Semiconductors.
Farnell Electronic Components Ltd, Canal Road, Leeds. (0532) 636311. Makes dealt with: Hitachi, National Semiconductors.
Hawke Electronics Ltd, Amotex House, 45 Hanworth Road, Sunbury on Thames, Middlesex. (01) 979 7799. Makes dealt with: Motorola, Texas Instruments. Will answer technical queries.
Hill Electronics (NI) Ltd, 290 Antrim Road, Belfast, Northern Ireland. Makes dealt with: Mostek.
ITT Multicomponents, Edinburgh Way, Harlow, Essex. (0279) 442971. Makes dealt with: Motorola, National Semiconductors, SGS, Texas Instruments and Hitachi.
Macro Marketing Ltd, Burnham Lane, Slough, Berkshire. (06286) 4422. Makes dealt with: Motorola, National Semiconductors, Zilog, Texas Instruments.
Quarndon Electronics Ltd, Slack Lane, Derby. (0332) 32651. Makes dealt with: Texas Instruments.
STC Electronics, Edinburgh Way, Harlow, Essex. (0279) 26777. Makes dealt with: Motorola, National Semiconductors, SGS, Texas Instruments and Hitachi.

Computer parts

Z80A: Zilog, SGS, NEC (Spectrum/ZX-81).
ULA: Ferranti (Spectrum/ZX-81).
ROM: Hitachi, NEC (Spectrum), Mostek, Motorola (ZX-81).
RAM: 4116 type — NEC, National Semiconductors, Texas Instruments, ITT (Spectrum). 4532 type — Texas Instruments, OKI (Manhattan Skyline) (Spectrum). 2114 type — Motorola, NEC (ZX-81). 4118 type — Mostek (ZX-81). 2K type — Mostek, Toshiba, Motorola, Texas Instruments, NEC (ZX-81).
LM1889: ICI4 — National Semiconductors (Spectrum).
TTL: 74LS00/74LS32/74LS157 — Texas Instruments, SGS, Motorola, National Semiconductors, NEC.

The following are all used on the 48K Spectrum.

Regulator: LM7805 +5V Reg. — SGS, NEC, Texas Instruments, Motorola.
Crystals, Capacitors, Resistors, Diodes, Sockets: available through general component suppliers.
Modulator: UM1233 Astec (UK) Ltd.
Leads: available at most TV/electrical shops.
Case parts: Sendale Plastics.
Keyboard: CPC.

Britain

Aylesbury Computer Club: 12 Long Plough, Aston Clinton, Aylesbury, Bucks.
Aylesbury ZX Computer Club: Ken Knight, 22 Mount Street, Aylesbury (5181 or 630867).
Basildon: Roundacre Microcomputer Users' Club. J Hazell, Basildon 285119/416333. Meetings every Wednesday 7.30 to 10.30pm.
Blackburn Computer Club: 1 Sutton Street, Feniscowles, Blackburn, Lancashire. Tel: B'burn 60033 (office hours) or 28127. Meets twice a month, subscription £5 (£3 juniors).
Bristol Yate and Sodbury Computer Club: 99 Woodchester Yate, Bristol, BS17 4TX.
Broughty Ferry Magic Micro Spectrum Users Club: Lindsay Darroch 78 Marlee Road, Broughty Ferry (0382) 75459 or Fraser McGuire, 7 Kenaway Place, Broughty Ferry, Dundee (0382) 75821.
Cardiff ZX Club: Steve Smith (0222) 593237 or Mike Hayes (0222) 371732. Meets twice a month.
Colchester Sinclair User Group: Richard Lown, 102 Prettygate Road, Colchester CO3 4EE.
Computer Club International, 6 Drumdoon Walk, Downpatrick, N. Ireland BT30 6UF.
Cornard Sinclair User Group: Neil MacDonald, 15 Potkiln Road, Great Cornard, Sudbury, Suffolk CO10 0DA.
Crewe and Nantwich Computer Users' Club: J E A Symondson, 46 London Road, Stapeley, Nantwich, Cheshire CW5 7JL.
Daventry & District Computer Club: c/o Daventry Ex-servicemen's Club, Market Square, Daventry, Northants.
Doncaster and District Micro Club: John Woods, 60 Dundas Road, Wheatley, Doncaster DN2 4DR; (0302) 29357.
Eastwood Town Microcomputer Club: E N Ryan, 15 Queens Square, Eastwood, Nottingham NG16 3BJ.
Edinburgh: Edinburgh Home Computing Club. John Palmer (031 661 3183) or Iain Robertson (031 441 2361).
EZUG-Educational ZX-80-81 Users' Group: Eric Deeson, Highgate School, Birmingham B12 9DS.
Furness Computer Club: R J C Wade, 67 Sands Road, Ulverston, Cumbria (Ulverton 55068). Meets every other Wednesday.
Glasgow ZX-80-81 Users' Club: Ian Watt, 107 Greenwood Road, Clarkston, Glasgow G76 7LW (041 638 1241).
Gloucester: Mid-weekly Spectrum User Group. Barry Ledbury, 8 Linnet Close, Gloucester GL4 9XA (0452) 23186.
Gravesend Computer Club: c/o The Extra Tuition Centre, 39 The Terrace, Gravesend, Kent DA12 2BA. Bi-monthly magazine and membership card.
Hassocks ZX Micro User Club, Sussex: Paul King (Hassocks 4530).
Hobbit Appreciation Society, 12 Middlefield Lane, Hinckley, Leicestershire LE10 0RB. Free newsletter with SAE.
Independent QL Users Group: Brian Pain, 24 Oxford Street, Stony Stratford, Milton Keynes MK11 1JU. Tel: 0908 564271. Publishes newsletter.
Inverclyde ZX-81 Users' Club: Robert Watt, 9 St. John's Road, Gourock, Renfrewshire PA19 1PL (Gourock 39967). Meets every other Monday at Greenock Society of the Deaf, Kelly Street, Greenock.
Keighley Computer Club: Colin Price, Redholt, Ingrow, Keighley (603133).
Lambeth Computer Club: Robert Baker, 32 Heatherington Road, London SW4 7NX.
Liverpool ZX Club: Meetings every Wednesday 7pm at Youth Activities Centre. Belmont Road, Liverpool 6. Keith Archer, 031-236 6109 (daytime).
Llanelli Computer Club: 40 Tan-Y-Bryn, Burry Port, Dyfed. Llanelli 56917.
Manchester Sinclair Users' Club: Meets every Wednesday, 7.30pm, at Longsight Library, 519 Stockport Road, Longsight — 061-225 6997 or 061 445 6316.
Meopham: National ZX Spectrum User Club. Guy Fullalove, Woodcotes, Camer Park, Meopham, Kent DA13 0XS. Bi-monthly newsletter, subscription £1.50. Send SAE for details.
Merseyside Co-op ZX Users' Group: Keith Driscoll, 53 Melville Road, Bootle, Merseyside L20 6NE; 051-922 3163.
Micro Users' Group: 316 Kingston Road, Ewell, Surrey KT19 0SY.
Mid-Kent Micro Club: Meets once monthly. Enquiries to M Gates, 65 Buckland Road, Maidstone ME16 0SH.
Mill Lane Association Computer Group: Bryan McAlley, 1 Cowleaze, Chinnor, Oxfordshire. (0844) 52426.
Newcastle (Staffs) Computer Club: Meetings at Newcastle Youth and Adult Centre, Thursday, 7.30. Enquiries to R G Martin (0782 62065).
North Hertfordshire Home Computer Club: R Crutchfield, 2 Durham Road, Stevenage; Meetings: first Friday of the month at the Settlement, Nevells Road, Letchworth.
Northern Ireland Sinclair Users' Club: P Gibson, 11 Fitzjames Park, Newtownards, Co Down BT23 4BU.
North London Hobby Computer Club: ZX users' group meets at North London Polytechnic, Holloway Road, London N7 Monday, 6pm.
Nottingham Microcomputer Club: ZX-80-81 users' group, G E Basford, 9 Holme Close, The Pastures, Woodborough, Nottingham.
Orpington Computer Club: Roger Pyatt, 23 Arundel Drive, Orpington, Kent (Orpington 20281).
Perth and District Amateur Computer Society: Alastair MacPherson, 154 Oakbank Road, Perth PH1 1HA (29633). Meetings: third Tuesday of each month at Hunters Lodge Motel, Bankfoot.
Regis Amateur Microcomputer Society: R H Wallis, 22 Mallard Crescent, Pagham, Bognor Regis, West Sussex PO21 4UU.
Roche Computer Club: 8 Victoria Road, Coop Rooms, Roche, Cornwall: 0726 890473. Twice weekly meetings, Monday and Friday.
Saltcoats Computer Club: Colin Borland, 117 High Road, Saltcoats, Ayrshire KA21 5SD. Weekly meetings.
Sinclair Postal User Group: 24 St. Mary's Way, Code SUL, Chigwell, Essex IG7 5BX. Produces magazine with competitions.
Scunthorpe ZX Club: C P Hazleton, 26 Rilestone Place, Bottesford, Scunthorpe; (0724 63466).
Sheffield: South Yorkshire Personal Computing Group. R Alderton (0742 20571), S Gray (0742 351440), P Sanderson (0742 351895).
Sinclair Amateur Radio User Group: SAE or two IRCs for details. Paul Newman G4 1NP, 3 Red House Lane, Leiston, Suffolk IP16 4JZ.
Sittingbourne: Anurag Vidyarth (0795 73149).
St Albans: Bi-monthly meetings and a magazine. Details from Adam Slater, 40 Watford Road, St Albans, Herts AL1 2HA. (0727 54176).
Stratford-on-Avon Computer Club: Meets on the second Wednesday of every month. Telephone: 0789 68080 for details.
Swansea Computer Club: B J Candy, Jr Gorlau, Killay, Swansea (203811).
Swindon ZX Computer Club: Andrew Bartlett, 47 Grosvenor Road, Swindon, Wilts SN1 4LT; (0793) 3077. Monthly meetings and library.
Sutton: Sutton Library Computer Club, D Wilkins, 22 Chestnut Court, Mulgrave Road, Sutton, Surrey SM2 6LR.
Washington Sinclair Users' Club, Columbia Community Centre, Tyne and Wear. Meets twice a month, tel. 4179483 or 4167367.
West Sussex: Midhurst and District Computer User Group. Enquiries to V Weston (073 081 3876), R Armes (073 081 3279).
Worle Computer Club: S W Rabone, 18 Castle Road, Worle, Weston-super-Mare BS22 9JW (Weston-super-Mare 513068).
Universal ZX Club: Postal club for Spectrum owners in the U.K. and abroad. C. Shaw, 1 Swiss Walk, Batley, W. Yorkshire.
ZX-Aid: Conrad Roe, 25 Cherry Tree Avenue, Walsall WS5 4LH. Please include sae. Meetings twice monthly.

Overseas

Australia: Australian ZX Users' Newsletter, incorporating QL User. Paul Janson, P.O. Box 397, Dapto 3530, Australia. Also seeks unpaid contributions for the newsletter.—W.A. ZX Users' Group, Garth Gregson, 34 Chester Street, South Fremantle 6162. Phone 3351671.
Austria: ZX User Club, Thomas Christian, c/o Wissenschaft Forscht e. V., Postfach 141, A1190 Vienna. Meets every first Friday of the month. Telephone 0222-44 32 050 for details.
Denmark: Danmarks National ZX-8081 Klub (DNZK), Jens Larson, Skovmosevej 6.4200 Slagelese, post giro 1 46 24 66.
ZZ-Brugergruppen i Danmark, Boks 44, 2650 Hvidovre, Gratis medlemskab og gratis blad til enhver interesseret.
J Niels-Erik Hartmann, OZ-ZX-Radioamator, Bruger Gruppe, Bredgade 25 DK-4900, Nakskov.
Finland: ZX-kerho, c/o Kalevi Hamalainen, Siltakatu 9 A 8, 33100 Tampere 10, Finland. Phone 35831-34238. Publishes quarterly paper.
France: Club Micro-Europe, Chemin du Moulin 38, B-1328 OHAIN, Belgium (19/32/2/6332769 ou soir 19/32/2/6537468) or Paris-Micro, 19 rue de Tilly, 92700, Colombes, France; associated with Club Micro-Europe.
08 Informatique Clubs, 18 rue P Curie, 08000 Charleville-Mezieres, 24/572106; associated with Club Micro-Europe.
Yves Chapron, no. SUS-1047, Rue du Puy, La Terrasse, 38660 Le Touvet, France. Specifically for users in the Alps.
Germany: ZX Club, a postal club; contact Aribert Deckers, Postfach 967, D-7000 Stuttgart 1, West Germany.
Greece: Athens Spectrum Club, Paris Stamelos, Spetsou 2, isi22 Marousi, Athens, Greece.
Indonesia: Jakarta ZX-80/81 Users' Club, J S Wijaya, PO Box 20, Jkukg, Jakarta, Utara, Indonesia.
Irish Amateur Computer Club: Martin Stapleton, 48 Seacourt, Clontarf, Dublin 3. (331304).
Irish Sinclair Users Club: PO Box 1238, Dublin 1. Publishes a newsletter. Send SAE for details.

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Italy: Sinclair Club, Via Molino Vecchio 10/F, 40026 Imola, Italy. Genova Sinclair Club; Vittorio Gioia, Via F Corridoni, 2-1, telephone 010 3125 51.

The Netherlands: Clive's Bits and Bytes, Paus Joannesstraat 32, 6235 CK Ulestraten. Telephone 043-644244.

Republic of Ireland: Irish ZX-8081 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.

Singapore: Sinclair Users' Group: Charles Wong, 1005 Upper Bukit Timah Road, Singapore 2367.

South Africa: Amateur Spectrum Users' Club, PO Box 280, Winklespruit, Natal 4145. Steve Reinemo is interested in corresponding with users worldwide.
South African Sinclair Users' Club: PO Box 3923, Randburg 2125. Simon Lucas, chairman. Tel. (011) 704 2596.
Dumont and Syndercombe Amateur Computer Club. Jean-Pierre Dumont would like to correspond with ZX-81 owners via tapes. Write to 8 Kipling Road, Farrarmere, Benoni 1500, Transvaal.

ZX SA Club: Jonathan Jones, House 14, Anglo Alpha PO Box 15, 1725 Roodepoorf.

Spain: Club Nacional de Usuarios del ZX-81, Joseph-Oriol Tomas, Avda. de Madrid, No 203 207, 10, 3a esc. A Barcelona-14 Espana. International ZX Spectrum Club: Gabriel Indalecio Cano, Sardana, 4 atrico 2a, San Andres de la Barca, Barcelona. Send international reply coupon. Produces a bi-monthly magazine. Spanish ZX Micro Club: Apartado 181, Alicante (Costa Blanca), Spain.
ZX Club Spain; C Benito PO Box 3253, Madrid, Spain.

Swedish ZX-club: Sinclair Datorklubben, Box 1007, S-122, 22 Enskede.

United States: Bay Area ZX-80 User Group, 2660 Las Aromas, Oakland CA94611.—Harvard Group, Bolton Road, Harvard MA 01451: (617 456 3967).—SAF Users' Group, 2749 Eden Road, Leslie, Michigan 49251.—ZX Users Group of New York, Box 560 Wall Street, New York, N.Y. USA 10005. Subscription $15US, publishes international newsletter. Seeks newsletter exchange with other groups.



If we have reviewed a program we have given it a rating known as the Gilbert Factor, named after our Software editor, John Gilbert. That factor includes clarity of instructions, speed of operations, ease of use, originality, lasting appeal, use made of graphics and sound, and success in accomplishing stated aims.

ZX-81

Adventure

Adventure	Bug-Byte	6
Adventure	Gavin Barker	6
Adventure 1	Abersoft	6
Black Crystal	Mastervision	7
Espionage Island	Artic	*
Greedy Gulch	Phipps	7
Inca Curse	Sinclair	*
Knight's Quest	Phipps	*
Lost Island	JRS	*
Magic Mountain	Phipps	*
Merchant of Venus	Crystal	7
Pharaoah's Tomb	Phipps	*
Pimania	Automata	6
Secret Valley	New Soft	*
Serpents Tomb	Vortex	*
Ship of Doom	Artic	7
Time Bandits	New Soft	*
Tomb of Dracula	Felix	*
Trader Trilogy	Quicksilva	6
Volcanic Dungeon	Mastervision	5
World of Illusions	Contrast	4

Arcade

Alien Dropout	Silversoft	*
Asteroids	Silversoft	8
Asteroids	Software Farm	6
Bank Robber	Romik	6
Bears in the Wood	Unicorn	6
Bubble Bugs	Romik	6
Byter	Protek	*
Cassette 1	Orwin	7
Cassette 2-5	Orwin	7
City Patrol	Sinclair	7
Damper	Quicksilva	7
Defenda	Quicksilva	8
Door Slammer	Cathedral	7
Forty-Niner	Software Farm	9
Froggy	DJL	7
Full-screen Breakout	New Generation	*
Galactic Trooper	Romik	6
Galaxians	Quicksilva	6
Galaxy Jailbreak	Romik	6
Games Tape 1	J K Greye	*
Games Tape 2	J K Greye	*
Games Tape 3	J K Greye	*
Gamestape 1	Fawkes Computing	7
Glooper	Quicksilva	7
Gloops	Quicksilva	5
Gobbler	Software Farm	*
Grand Prix	dk'tronics	*
Gulp 2	Campbell	*
Hang Glider	S Electronics	6
Hickstead	CCS	5
High-resolution Invaders	Odyssey	*
Invaders	Abersoft	*
Invaders	Bug-Byte	5
Invaders	Odyssey	8
Invaders	Selec	7
Krazy Kong	PSS	*
M. Mouse goes de-bugging	Lothlorien	7
Maze Death Race	PSS	*
Maze Man	Abersoft	*
Mazogs	Bug-Byte	8
Micro Mouse	Lothlorien	7
Namtir Raiders	Artic	8
Night Gunner	Digital Integration	5
Rocket Man	Software Farm	7
Sabotage	Sinclair	6
Six Games	A Stubbs	5
Space Raiders	Sinclair	*
Space Rescue	D. Pinch	7
Space Trek	JRS	*
3D Monster Maze	New Generation	9
Three Games Cassette	McGraw Hill	8
Zuckman	DJL	8
ZX Invasion Force	Artic	*
ZX Panic	Selec	4
ZX-81 1K Games Pack	Crystal	9
ZX-81 Pocket Book	Phipps	*

Business

Accounts (Limited company)	Hestacrest	*
Accounts (Sole Trader)	Hestacrest	*
Business Bank Account	Transform	*
Critical Path Analysis	Hilderbay	6
Draft	Myrmidon	*
Mailing List	Hestacrest	*
Payroll	Hilderbay	*
Payroll	Soft Tech	*
Payroll	V&H Computing	*
Personal Banking System	Hilton	*
Purchase Ledger	Hestacrest	*
Sales Day Book	Transform	*
Sales Ledger	Hestacrest	*
Text	Contrast	8

Education

Binary Brains	Pooter	5
Calpac 1-2	Calpac	*
Four Rules of Number	Micro Master	*
Integration	University	8
Intermediate English 1-2	Rose	*
Language Devel. Series	Glasson	*
Language Devel. Series	Micro Master	*
Linear Programming	University	*
Matrix Operations	University	7
O Level Chemistry	Calpac	*
O Level French Revision	Rose	*
O Level Maths Revision	Rose	*
Polynomials	University	*
Primary Arithmetic	Rose	*
Regression	University	*
Self teach Program	Anvil	*

Language

Forth	Sinclair	7
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Practical

Ephemeris	Bridge	7
Poolster	Naigram	3

Puzzle

Nowotnik Puzzle	Phipps	*
Word Fit	Ram Writer	6

Simulation

Flight Simulation	Sinclair	6
Pilot	Hewson	7
Print Shop	CCS	*

Strategy

Airline	CCS	7
Auto Chef	CCS	7
Battleships	JRS	*
Conflict	Martech	7
Cyborg Wars	Stratagem	7
Dallas	CCS	6
Dictator	Bug-Byte	7
Fighter Pilot	Digital Integration	5
Football Manager	Addictive Games	7
Fort Apache	Contrast	8
Galaxy Conflict	Martech	8
Great Britain Ltd	Hessel	*
Ocean Trader	Quicksilva	7
Pioneer Trail	Quicksilva	7
Racehorse Trainer	G Barker	6

Traditional

Do Not Pass Go	Work Force	*
Lynchmob	Bridge	6
Original Superchess	CP Software	*
Tai	PSS	*
ZX 1K Chess	Artic	*
ZX Compendium	Mastervision	7
ZX-Chess 1	Artic	*

Utility

Graphics	IPA	*
Graphics Toolkit	JRS	9
HI Resolution	CRL	6
Machine Code Test Tool	OCP	*
MCoder	PSS	8
Programme Enhancement Package	R and R	*
Renumber Delete	Work Force	*
Trace	Texgate	7
ZX Compiler	Silversoft	*
ZX Screenkit	Picturesque	*
ZX-81 Remload	Picturesque	*
ZX-Bug	Artic	*
ZXAS	Bug-Byte	*
ZXDB	Bug-Byte	*

SPECTRUM 16K

Adventure

Android One	Vortex	*
Escape	New Generation	8
Mines of Saturn/Return to Earth	Micro-Gen	*
Moria	Severn	*
Planet of Death	Artic	6
Secret Valley	New Soft	*
The Great Western	New Soft	*
Time Bandits	New Soft	*

Arcade

Aquarius	Bug-Byte	6
Arcadia	Beau Jolly	5
Arcadian	J K Greye	6
Assassin	Spectrasoft	*
Avenger	Abacus	5
Baron	Temptation	*
Base Invaders	Imagination	*
Black Hole	Quest	6
Blind Alley	Sunshine	7
Cassette A	Orwin	*
Caterpillar	CDS	*
Cavern Fighter	Bug-Byte	4
Centi-Bug	dk'tronics	*
Children's Compendium	Dymond	*
City Defence	Mikro-Gen	*
Colour Clash	Romik	4
Cookie	Ultimate	*
Cosmic Guerilla	Crystal	8
Crazy Cranes	Voyager	5
Creepy Crawler	Mikro-Gen	*
Crevasse and Hotfoot	Microsphere	7
Cruising	Sunshine	4
Cyber Rats	Silversoft	7
Death Chase	Micromega	6
Demolition	Comp. Rentals	*
Destroyer	Winters	*
Di-lithium Lift	Hewson	3
Doombugs	Work Force	8
Dymonoids	Dymond	*
Earth Defence	Artic	5
Ed-On	Add-On	4
Eskimo Eddie	Ocean	*
Family Games Pack	Hornby	*
Fireflash	Abacus	5
Froggy	DJL	7
Fruit Machine	dk'tronics	6
Galactians	dk'tronics	*
Galactic Trooper	Romik	3
Galactic Warriors	Abacus	6
Galaxians	Artic	6
Ghost Hunt	PSS	*
Gnasher	Mastertronic	4
Gobble-a-Ghost	CDS	*
Gobbleman	Artic	*
Godzilla and Martians	Temptation	7
Ground Attack	Silversoft	6
Gulpman	Campbell	*
Haunted Hedges	Micromega	6
Hopper	PSS	6
Horace and the Spiders	Sinclair	8
Horace Goes Skiing	Sinclair	8
Hungry Horace	Sinclair	8
Invasion Force	Artic	8

It's the Wooluf	Crystal	5
Jet Pac	Ultimate	8
Labyrinth	Axis	4
Leap Frog	CDS	*
Luna Crabs	Micromega	7
Magic Meanies	CDS	2
Maze Chase	Hewson	8
Meteor Storm	Quicksilva	7
Nanas	Mikro-Gen	*
Orbiter	Silversoft	7
Ostron	Softek	*
Pengy	Micromania	4
Pitman Seven	Visions	*
Planetoids	Sinclair	8
Proteus	Abacus	5
Rapedes	Visions	*
Repulsar	Softek	*
Rider	Virgin	6
Road Toad	dk'tronics	7
Robot Panic	Soft Mill	1
Sam Spade	Silversoft	5
Santa	Artic	*
Sentinel	Abacus	7
Shark Attack	Romik	5
Sheer Panic	Visions	7
Sir Lancelot	Melbourne House	7
Slippery Sid	Silversoft	8
Space Fighter	Winters	*
Space Intruders	Quicksilva	7
Space Lanes	Cathedral	*
Space Raiders	Sinclair	6
Space Zombies	Mikro-Gen	*
Spec. Gobbleman	Artic	*
Spec. Invaders	Artic	*
Spec. Invasion Force	Artic	*
Spec. Scramble	Work Force	7
Spectipede	Mastertronic	5
Spectral Invaders	Bug-Byte	8
Spectral Panic	Hewson	5
Spectres	Bug-Byte	6
Strike Four	Spectresoft	4
Styx	Bug-Byte	7
Sub	Romik	*
Tank Battle	dk'tronics	8
3D Monster Chase	Romik	3
Train Game	Microsphere	9
Trom	dk'tronics	4
Vortex	JK Greye	5
Winged Warlord	CDS	6
Wizard's Warriors	Abersoft	*
Yomp	Virgin	7

Business

Finance Manager	OCP	9
Home Computer Pack	SD Micro	*
Masterfile 16	Campbell	*
Matcalc	Work Force	*
Micropen	Contrast	*
Vu-Calc	Sinclair	7
Vu-File	Sinclair	8

Education

Alphabet Games	Sinclair	*
Apostrophe	Sinclair	7
Ballooning	Heinemann	*
Calpac 1-3	Calpac	*
Car Journey	Heinemann	*
Cargo	Sinclair	*
Chess Tutor	Artic	7
Counting	Starter Soft	*
Counting	Widget	*
Education One	Lerm	*
Educational	Startersoft	*
Firework Music	Soft Cottage	8
40 Educational Games	Granada	*
Four Rules of Number	Micro Master	*
French Voc Test	Tutorial	*
Hidden Letters	Poppy	*
Hot Dot Spotter	Longman	*
Integration	University	8
Intermediate English 1-2	Rose	*
Know Your Tables	Collins	*
Language Devel. Series	Micro Master	*
Learn Basic	Logic 3	*
Learning Read 1	Poppy	*
Linear Programming	University	*
Marks Book	Lerm	*
Maths Invaders	Stell	*
Matrix Operations	University	7
Money	Poppy	7
Night Sky	Bridge	*
O Level Maths	Homestudy	*
O Level Physics	Homestudy	*
Paddington's Shopping Mix-up	Collins	*
Pathfinder	Widget	*
Polynomials	University	8
Pre/early school cassettes	Essex	*
Primary Arithmetic	Rose	*
Punctuation Pete	Heinemann	*
Regression	University	8
Self-teach Program	Anvil	*
Shape Sorter	Widget	*
Special Agent	Heinemann	*
Spellbin	Startersoft	*
Use and Learn	Microl	8

Language

Beta Basic	Betasoft	9

Practical

Biorhythms	Spectrasoft	*
Countries of the World	Hewson	8
Cycle Planner	Medidata	4
Map of the UK	Kuma	7
Shopping List	SD	*
Spectrasort	Spectradraw	4

Puzzle

Flippit	Sinclair	7
Hanoi King	Contrast	7
Lojix	Virgin	3
Nowotnik Puzzle	Phipps	7
Quazar	Rose	4

Simulation

Air Traffic Controller	Hewson	6
Airliner	Protek	6
Golf	R & R	7
Golf	Virgin	7
NightFlite	Hewson	5
Print Shop	CCS	8
Pro-Golf	Hornby	7

Strategy

Auto Chef	CCS	*
Big Match Soccer	Winters	*
Dallas	CCS	6
Dictator	dk'tronics	*
Football	Winters	*
Heathrow	Hewson	8
Las Vegas	Temptation	*
Quincy	Severn	*

Traditional

Backgammon	Hewson	*
Bridge Tutor	CP Software	8
Bridgemaster	Serin	9
Challenge	Temptation	*
Gambling Tape	Dymond	*
Las Vegas	Temptation	5
Odds-on	RSD	*
Othello	CP Software	*
Pinball	Winters	*
Pool	Bug-Byte	7
Reversi	Sinclair	8
Solo Whist	Video Soft	*
Spec. Microchess	Artic	*
Super Play 1	Video Soft	*
Tennis	Winters	*

Utility

Aspect	Bug-Byte	5
Audio Sonics	Work Force	4
Auto Sonics	Buttercraft	5
Basic Utilities	Jaysoft	6
Character Generator	Spectrasoft	*
Dietron	Custom	6
Disassembler	dk'tronics	7
Display	Work Force	*
Editor/Assembler	Picturesque	8
Extended Basic	CP Software	7
FP Compiler	Softek	9
Friendly Face	Monitor	7
Keysounder	S and G	*
Letterfont	Allanson	8
Machine Code Test Tool	OCP	7
Master Toolkit	OCP	7
MCoder	PSS	8
Micropen	Contrast	*
Print Utilities	Sinclair	7
Programmer's Dream	Work Force	8
Renumber Delete	Work Force	*
Slow Loader	ELR	9
Sound FX	dk'tronics	6
Spec. Editor/ Assembler	Picturesque	8
Spec. Monitor	Picturesque	7
Spectrum Super Toolkit	Nectarine	8
Spectsound	PDQ	2
Supercode	CP	8
Taswide-64	Tasman	*
Trace	Texgate	8
TT-S	Timedata	8
ZX Spectrum Assembler	McGraw Hill	4
ZXED	dk'tronics	*

SPECTRUM 48K

Adventure

Abyss	CCS	6
Ace in the Hole	Add-on	*
Adventure 1	Abersoft	6
Adventure Island	Contrast	*
Alchemist	Beau Jolly	7
Arcane Quest	Add-on	*
Atlas Assignment	Virgin	7
Black Crystal	Mastervision	7
Black Dwarf's Lair	New Soft	*
Black Planet	Phipps	7
Buffer Adventure	Buffer Micro	6
Castle	Bug-Byte	*
Castle Blackstar	SCR	7
Circus	Channel 8	8
Classic Adventure	Melbourne House	*
Colditz	Phipps	8
Colossal Caves	CP Software	8
Cry Wolf!	Add-on	*
Demon Lord	MCE	5
Detective	Arcade	7
Diamond Quest	CCS	4
Diamond Trail	Gilsoft	7
Dragonsbane	Quicksilva	6
Dungeon Master	Crystal Comp.	8
Dungeons of Doom	Temptation	3
Erik the Viking	Level Nine	8
Espionage Island	Artic	5
Eureka	Domark	8
Everest Ascent	Shepherd	6
Eye of Bain	Artic	7
Fantasia Diamond	Hewson	7
Flight from the Dark	Hutchinson	8
Frog Face	Positive Image	7
Golden Apple	Artic	7
Gorgon	Phipps	*
Halls of Things	Crystal Comp.	9
Hampstead	Melbourne House	8
Here comes the sun	Alligata	7
Hobbit	Melbourne House	9
Hole	Add-on	*
Horror Atoll	Add-on	*
Inca Curse	Artic	6
Inferno	Shepherd	7
Invincible Island	Shepherd	7
Island	Crystal	4
Island	Virgin	7
Jericho Road	Shards	7
Jungle Adventure	CCS	4
Kentilla	Micromega	6
King Arthur's Quest	Hill MacGibbon	4
Knight's Quest	Phipps	6
Leopard Lord	Add-on	4
Lords of Midnight	Beyond	9
Lords of Time	Level Nine	8
Lost Over Bermuda	Add-on	*
Mad Martha	Mikro-Gen	7
Mad Martha II	Mikro-Gen	*
Mountains of Ket	Incentive	8
Murder at Manor	Gemtime	7
Mysterious Fairground	Buffer Micro	6
Odyssey of Hope	Martech	6
Oracle's Cave	Doric	8
Orb	Comp. Rentals	*
Orc Slayer	Gamma Software	5
Paradox	Runesoft	2
Perseus and Andromeda	Channel 8	7
Peter Pan	Hodder & Stoughton	6
Pimania	Automata	7
The Prince	CCS	8
Quest	Hewson	7
Quetzalcoatl	Virgin	8
Return to Eden	Level Nine	8
Roundsby Incident	Add-on	*
Satan's Pendulum	Minatron	7

Sherlock	Melbourne House	9
Ship of Doom	Artic	7
Solaris	Softel	*
Spoof	Runesoft	7
Superspy	Shepherd	5
System 15000	Craig Communications	9
Temple of Vran	Incentive	8
Terror from The Deep	Add-on	*
The Final Mission	Incentive	7
The Wild Bunch	Firebird	3
Tir Na Nog	Gargoyle	9
Titanic	R&R	5
Tower of Despair	Games Workshop	5
Transylvanian Tower	Shepherd	7
Twin Kingdom Valley	Bug-Byte	8
Urban Upstart	Shepherd	*
Valhalla	Legend	7
Vampire Village	Terminal	4
Velnor's Lair	Quicksilva	8
Volcanic Dungeon	Mastervision	6
War of the Worlds	CRL	4
Width of the World	Mosaic	4
Ziggarat of Dread	Add-on	*

Arcade

Ad Astra	Gargoyle Games	8
Adven. of a St Bernard	Mastertronic	7
Alcatraz Harry	Mastertronic	3
Android Two	Vortex	*
Ant Attack	Quicksilva	8
Antics	Bug-Byte	8
Arena 3000	Microdeal	5
Armageddon	Silversoft	3
Astroplanner	Romik	2
Atic Atac	Ultimate	8
Automania	Micro-Gen	6
Avalon	Hewson	9
Base Invaders	Work Force	6
Battle Zone	Quicksilva	5
Beach Head	US Gold	8
Bear Bovver	Artic	8
Bewarehouse	Positive Image	4
Birds and Bees	Bug-Byte	8
Black Hawk	Creative Sparks	7
Blade Alley	PSS	6
Blue Thunder	Foundry Systems	6
Booty	Firebird	7
Brain Damage	Silversoft	*
Bubble Buster	Sinclair	5
Bubble Trouble	Arcade	*
Bugaboo	Quicksilva	7
Butterfly	Pulsonic	4
Buzz Off	Electric	5
Caesar the Cat	Mirrorsoft	7
Carnival	Eclipse	5
Carpet Capers	Terminal	7
Cavelon	Ocean	7
Centipoid Plus 3	Orwin	5
Chequered Flag	Sinclair	8
Chinese Juggler	Ocean	5
Chuckie Egg	A & F	8
Chuckman	CCI/Add-on	8
Close-In	Pulsonic	4
Codename Mat	Micromega	9
Corridors of Genon	New Generation	9
Cruise Attack	Mikro-Gen	*
Crusoe	Automata	5
Cyber Zone	Crystal	*
Cyclone	Vortex	8
Daley Thompson's Decathlon	Ocean	8
Dangermouse in Double Trouble	Creative Sparks	8
Death Chess 5000	Artic	7
Defenda	Interstella	2
Deffendar	Mikro-Gen	*
Defusion	Incentive	6
Defusion/Worms	K-Tel	3
Demon	Microcosm	*
Demon Chase	Mansfield	4
Deus Ex Machina	Automata	9
Devil Rides In	Mastertronic	7
Dimension Destructors	Artic	8
Dinky Digger	Postern	4
Dodge City	Phoenix	7
Dr Franky and the Monster	Virgin	6
Dragonfire	Cheetahsoft	5
Driller Tanks	Sinclair	3
Energy 30,000	Elm	3
Eric and the Floaters	Sinclair	6
Eskimo Eddie	Ocean	4
Exodus	Firebird	3
Frank N Stein	PSS	7
Fred	Quicksilva	6
Freez Beez	Silversoft	*
Froot Loop	NTD Software	5
Galaxy Attack	Sunshine	4
Ghost Rider	Positive Image	4
Gilligan's Gold	Ocean	6
Glug Glug	CRL	6
H. Dumpty and the F. Wuzzies	Artic	5
Harry Goes Home	Pulsonic	6
Hickstead	CCS	4
High Noon	Work Force	9
House of Living Dead	Phipps	*
Hunchback	Ocean	7
Invasion Body Snatch.	Crystal	9
Jack and the Beanstalk	Thor	5
Jackpot	Comp. Rentals	*
Jet Set Willy	Software Projects	9
Jump Challenge	Martech	6
Killer Knight	Phipps	5
Knight Rider	Hewson	*
Kokotoni Wilf	Elite	6
Kosmic Kanga	Micromania	5
Krakatoa	Abbex	8
Krazy Kong	PSS	*
Kung-Fu	Bug-Byte	6
Laser Zone	Quicksilva	8
Laserwarp	Mikro-Gen	6
Last Sunset Lattica	Arcade	*
Lazatron	Contrast	*
Les Flics	PSS	6
Loony Zoo	Phipps	6
Lunar Jetman	Ultimate	8
Magic Roundabout	CRL	4
Manic Miner	Bug-Byte	9
Matrix	Salamander	7
Maze Death Race	PSS	*
Maziacs	dk'tronics	8
Metagalactic Llamas	Salamander	8
Mission Impossible	Silversoft	6
Mission Omega	Pulsonic	4
Monkey Biznes	Artic	7
Moon Alert	Ocean	*
Moons of Tantalus	Cornhill	5
Mr Wimpey	Ocean	7
Mummy Mummy	Lothlorien	6
Munnery's Mergatroids	Abacus	6
New Cylon Attack	A'N'F	5
Night Gunner	Digital Integration	6
1994	Visions	4
Olympimania	Automata	6
Orion	Software Projects	5
Pedro	Beau Jolly	7
Penetrator	Melbourne House	7
Pi-Balled	Automata	7
Pi-Eyed	Automata	6
Pingo	Profisoft	6
Psi-Spy	Postern	5
Pssst	Ultimate	7
Psytron	Beyond	9
Pyjamarama	Mikro-Gen	8
Pyramid	Fantasy	8
Raider Cursed Mine	Arcade	*
Rapscallion	Bug-Byte	6
Reactor	Gemini	7
Rescue	Comp. Rentals	*
Rescue	Ocean	*
Revenge of the Killer Tomatoes	Visions	6
Rider	Virgin	6
River Rescue	Creative Sparks	3
Robot Riot	Silversoft	6
Rommels Revenge	Crystal	8
Sabre Wulf	Ultimate	8
Scuba Dive	Durrell	9
Security Shelter	Add-on	*
Select 1	Computer Records	
	Various	7
Skull	Games Machine	5
Snowball	Level 9	9
Sorcery	Virgin	7
Space Station Zebra	Beyond	6
Spectron	Virgin	6
Spellbound	Beyond	7
Splat	Incentive	8
Sports Hero	Melbourne House	6
Stagecoach	Creative Sparks	7
Starbike	The Edge	6
Stop the Express	Sinclair	8
Strangloop	Virgin	9
Submarine Strike	Pulsonic	6
Tank Trax	Mastertronic	3
Technician Ted	Hewson	7
Terrahawks	CRL	5
The Guardian	PSS	6
The Pyramid	Fantasy	7
The Snowman	Quicksilva	8
3D Bat Attack	Cheetahsoft	6
3D Lunattack	Hewson	6
3D Seiddab Attack	Hewson	5
3D Star Wars	Add-on	1
3D Tank Duel	Real Time	6
3D Tunnel	New Generation	9
Tiler Tim	Microwish	6
Time Gate	Quicksilva	8
Timebomb	CDS	7
Tobor	Add-on	7
Tornado Low Level	Vortex	8
Tranz Am	Ultimate	*
Trashman	New Generation	8
Travel with Trashman	New Generation	7
Traxx	Quicksilva	7
Tribble Trubble	Software Projects	8
Trom	dk'tronics	4
Turtle Timewarp	Softstone	4
Tutankhamun	Micromania	8
Two-Gun Turtle	Lothlorien	7
Warlock of Firetop Mountain	Penguin	*
Wheelie	Microsphere	7
Worm Attack	Pulsonic	2
Worse Things Happen at Sea	Silversoft	7
Wrath of Magra	Mastervision	8
Xadom	Quicksilva	4
Zenji	Activision	8
Zig-Zag	dk'tronics	7
Zipper Flipper	Sinclair	4
Zombie Zombie	Quicksilva	7

Business

Account Management System	Fulwood	*
Accounts (Limited Company)	Hestacrest	*
Accounts (Sole Trader)	Hestacrest	*
Address File	SD Micro	*
Address Manager	OCP	7
Bank Account System	K Gouldstone	8
Bank Verifier	SD Micro	*
Business Bank Account	Transform	*
Cash Controller	Shepherd	7
Collector's Pack	Sinclair	7
Critical Path Analysis	Hilderbay	*
Database	Microl	7
DIY Book-keeping	RAMTOP	*
Heathplanner	Heath Computing	7
Home Budget	Kuma Computers	5
Investment, Insurance, Information	Inform	5
Invoicing/Accounting	Transform	8
Keyfile	Keysoft	7
Masterfile	Campbell	8
Micropen	Contrast	5
Money Manager	Creative Sparks	6
Multi-File	ISP	6
Omnicalc	Microsphere	9
Payroll	Transform	*
Payroll	V&H Computing	*
Personal Banking System	Hilton	*
Personal Financ. Management Syst.	Fulwood	*
Sales Day Book	Transform	*
Sales Ledger	Hestacrest	8
Small Business Accounts	Sinclair	*
Spectext	McGraw Hill	7
Spreadsheet	Microl	7
Stock Control	Hilderbay	*
Stock Control	Kemp	*
Stock Control	Transform	*
Tasword	Tasman	8
Tasword II	Tasman	9
Utility File	SD Micro	*
Va£Track	Morley Davies	7
Word Processor	Quicksilva	2
Meteoroids	dk'tronics	7
Meteoroids	Softek	6
Micro Mouse	Lothlorien	6
Millypede	Add-on	7
Mined Out	Quicksilva	7
Moon Buggy	Visions	6
Mr Wong's Loopy Laundry	Artic	6
Muncher	Silversoft	6

Education

ABC Liftoff	Longman	*
Angle	Chalksoft	5
Angle Turner	Arnold Wheaton	7
Astro Maths	Scisoft	6
Biology	Longman	7
Blockbuster	Compusound	7
Castle	L'Ensouleiado	7
Castle of Dreams	Widgit	7
Castle Spellerous	Sinclair	8
Chess Tutor 1	Sinclair	7
Cortes	L'Ensouleiado	6
Countabout	Longman	*
Dyslexia Beater	Dunitz	8
Eiffel Tower	Chalksoft	6
Electronic Learner's Guide No. 1	ETST	6
French	Longman	8
French is Fun	CDS	5
French Mistress	Kosmos	*
French Voc Test	Tutorial	*
Friend or Foe	Longman	6
Viking Raiders	Firebird	6
German is Fun	CDS	8
German Master	Kosmos	*
Guitar Tutor 1	Harlequin	*
Guitar Tutor 2	Harlequin	*
Handwriting	Chalksoft	*
Highway Code	Learning Systems	6
Hotline	Chalksoft	5
Humpty Dumpty	Widget	8
Inkosi	Chalksoft	5
Jungle Jumble	Clever Cloggs	*
Jungle Maths	Scisoft	*
Learn to Read 1-5	Sinclair	7
Letters and Numbers	Jimjams	*
Linkword	Silversoft	6
Look Sharp	Mirrorsoft	7
Magnets	Sinclair	*
Make-a-Chip	Sinclair	*
Mansfield Park	Sussex	7
Mathskills II	Griffin	7
MDA-PCSS	MDA Assoc.	7
Mr T's Measuring Games	Ebury	7
Mr. Men	Mirror	*
Musicmaster	Sinclair	6
Nineteenth C. England	Sussex	8
O Level Chemistry	Calpac	*
O Level Physics	Think Tank	*
Party Time	C. Tutor	*
Pathfinder	Widget	7
Pirate	Chalksoft	7
Postman Pat's Trail Game	Longman	7
Quick Thinking	Mirrorsoft	*
Riddle of the Sphinx	Longman	6
Run, Rabbit, Run	Longman	7
Sequences	Chalksoft	5
Snaffle	Longman	8
Spanish Gold	Chalksoft	*
Speak and Spell	S and G	*
Speech Marks	Sinclair	7
Spelling Bee	Image Systems	5
Star Reader	Scisoft	*
Startrucker	Widget	7
SuperTed	Longman	6
Teacher Data	B Farris	8
Tense French	Sullis	7
Time Traveller	Willey	*
Tuner	Soft Cottage	*
Whizz Kid	Comp. Tutor	*
Wizard Box	Scisoft	*
Words and Pictures	Chalksoft	6
Word Wizard	Longman	6
Zoo	L'Ensouleiado	6

Language

Beta Basic	Betasoft	9
Forth	Melbourne House	9
Forth	Sinclair	7
48/80 Forth	E London Robotics	7
Hisoft C	Hisoft	9
Logo	Sinclair	9
Micro Prolog	Sinclair	8
Pascal Computer	Hi-Soft	*
Snail Logo	CP	8
Spec. Forth	Abersoft	9
Spec. Forth	CP	8
ZX Forth	Artic	8

Practical

Astronomer	CP Software	7
Beamscan	Beamscan	9
Computer Cookbook	Bug Byte	5
Cricket Averages	Spartan CC	7
Diet	dk'tronics	*
Diet Master	Diet Master	6
Dietician	Keysoft	4
Engine Diagnostic	Spectrasoft	*
First Aid	Eastmead	4
Football Pools	Hartland	*
How Long have you got?	Eastmead	6
I Ching	Salamander	7
I Ching	Sirius	*
Know Your Own Personality	Mirrorsoft	6
Personal Reminder	SD Micro	*
Spectadraw 2	McAlley	*
Star Gazer	CRL	8
The Complete Guide to Medicine	Eastmead	4
Vega-Table	Vega	7
World Info	Wimsoft	*

Puzzle

Arcturus	Visions	7
Computaword	Work Force	2
Flix	Softricks	7
Hanoi King	Contrast	*
Hareraiser	Haresoft	3
Jumbly	dk'tronics	*
Mazecube	PAL	6
Stuart Henry's Pop Quiz	Bellflower	7
3D Strategy	Quicksilva	8

Simulation

American Football	Mind Games	
Ashes	Pulsonic	7
Combat Lynx	Durrell	8
Cricket Captain	Allanson	6
Fighter Pilot	Digital Integration	*
Flight Simulation	Sinclair	6
Full Throttle	Micromega	8
Golf	Virgin	8
Hareraiser	Haresoft	3
Howzat	Wyvern	8
Inkos	Chalksoft	*
Match Point	Sinclair	9
New Birkdale	Hornby	8
Olympics	CRL	6
Royal Birkdale	Ocean	8
Strike Attack	Micromart	4
Super Soccer	Winters	4
Test Match	Comp. Rentals	6
The Forest	Phipps	7
Troon	Hornby	8
United	CCS	4
World Cup Football	Artic	7

Strategy

Airline	CCS	7
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Confrontation Scenarios Volume 1	Lothlorien	7
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